

Exploring Dairy Agriculture and Careers



THE UNIVERSITY OF VERMONT
EXTENSION



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Introduction

To All You Amazing Vermont Educators,

If your students like ice cream in the summer, cheese on their pizza, or butter on their toast, chances are they have enjoyed the taste of Vermont dairy.

Vermont dairy products are everywhere, and Vermont would not be the state we love if it weren't for its farms and farmers. Dairy farmers also help keep our state green by maintaining land for growing crops, and providing opportunities for healthy, active kids to bike, hike, ski, or hunt.

We hope that this book is a valuable tool to help students learn about all things dairy, and all things Vermont. Learning about dairy and farming is important to Vermont's future, and we are grateful that you are taking on this challenge.

Thank you for your leadership in the classroom and offering Vermont's students an understanding of agriculture in Vermont.

Sincerely,
Anson Tebbetts
Secretary
Vermont Agency of Agriculture, Food and Markets

After more than a century, the enduring quality of the education that 4-H continues to deliver is a key part of the reason our Vermont dairy business remains significant and how our state remains relevant in this sector.

This "Exploring Dairy Agriculture and Careers" curriculum is another tool in the slate of incredible resources provided to our teachers, parents and other influencers who will be further empowered to teach science-based lessons to the next generations of students who will take the baton up and carry Vermont dairy into the foreseeable future.

I applaud the collaborative efforts of UVM 4-H and the Vermont Agency of Agriculture, Food and Markets who have come together to produce this curriculum, and I further offer words of thanks to our Vermont educators who will do the valuable work of ensuring that the lessons are taught, learned and practiced.

I convey hearty thanks to all involved in helping Vermont remain a healthy community of active performers in cutting-edge dairying.

Sincerely,
Roy Beckford
Associate Dean and Director
University of Vermont Extension

Author's Forward

The purpose of this curriculum is to provide the opportunity for educators and students to explore some of the many jobs that are part of Vermont agriculture. Not all agricultural careers are covered in this publication, but I hope that it opens the door to further career exploration.

In 2020, there were 19.7 million full- and part-time jobs related to the agricultural and food sectors — 10.3 percent of total U.S. employment.* The Vermont agricultural industry is part of this huge sector of U.S. employment opportunities, and the depth of professionals and services who support agriculture in our state and communities is vast.

Thank you for your partnership in helping the next generation of Vermont leaders and farmers understand the value and importance of the dairy industry.

Martha Edwards Manning
UVM Extension 4-H Educator

* USDA Economic Research Service.

<https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy/>

How to Use This Curriculum

I hope that you enjoy this curriculum. While designed for students at the middle school level many of the activities may also be enjoyed by older or younger students.

This publication is divided into several key sections:

- **Exploring a Vermont Dairy Farm** explains key topics for any discussion on the dairy industry and includes several fun student activities. The answer keys to activities are located in an appendix at the end of the booklet. Some activities require Internet access to research answers and information.
- **Dairy Industry Careers** highlights six different career clusters which a dairy farmer might rely on to assist with their operations. This section includes a “deeper dig” into each sample career and an exercise interviewing an expert in each career field.
- **Career Directory** provides an introduction and small sampling of dairy industry-related careers, and is intended to inspire students to explore career opportunities.
- **Glossary** provides definitions of many familiar and unfamiliar terms.
- **Answer Key Appendix** provides answers to crossword puzzles and other activities.

The lessons and activities in the Exploring a Dairy Farm and Dairy Industry Careers sections include life skill(s), SET ability, Vermont Science Standards, and employment/career skill(s).

Students will find it helpful to have access to the Career Directory and Glossary sections to research answers to questions in the booklet activities, and a set of Answer Keys (Appendix 1) is provided at the end of the booklet.

PART I: EXPLORING A VERMONT DAIRY FARM



Dairy Cow Breeds

- » Life Skill: Critical Thinking, Learning to learn
- » SET Ability: Inquiry skills
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Problem-solving skills



There are 7 major breeds of dairy cattle commonly found on Vermont farms: Ayrshire, Brown Swiss, Guernsey, Holstein, Jersey, Milking Shorthorn, and Red and Whites.

The Midwest Dairy “Dairy Cows” website (<https://www.midwestdairy.com/sustainability/farm-life/dairy-cows/>) explains the origin, characteristics, and fun facts about each breed.

Ask students to complete the following table using information from the Midwest Dairy website or the individual breed registry pages.

BREED	COUNTRY OF ORIGIN	COLOR	ONE INTERESTING FACT
Ayrshire			
Brown Swiss			
Guernsey			
Holstein			
Jersey			
Milking Shorthorn			
Red & Whites			

Additional discussion points

1. What breed typically produces the most pounds of milk per lactation?
2. What breed is known for producing “golden” milk?
3. What breed is known for producing milk with the highest percent butterfat*?

* Butterfat production is important when making many dairy products especially butter.

Dairy Anatomy Comparison

- » Life Skill: Decision-making, Teamwork
- » SET Ability: Inquiry skills, Collaboration
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Collaboration skills, Teamwork skills

Comparing and contrasting human and dairy cow anatomy can be interesting and fun.

Divide students into groups of 2 or 3. Every group should read each description and discuss whether it applies only to human, only to dairy cows, OR if it applies to both humans and cows.

Check the appropriate box that the description applies to. Once every group has completed the chart, review the results as a class and have further discussions.

	HUMANS ONLY	COWS ONLY	BOTH
Has over 140 feet of intestines			
Has a 1-compartment stomach			
Regurgitates its food as part of the digestion process			
Has a pregnancy of approximately 280 days			
Has a 4-chamber heart			
Is a mammal			
Has the ability to sweat as a means of cooling the body			
Has 49-51 bones in the spine			
Has a normal body temperature of 98.6 degrees F			
Has 2 knees			
Has cloven feet			
Is born with no upper teeth			

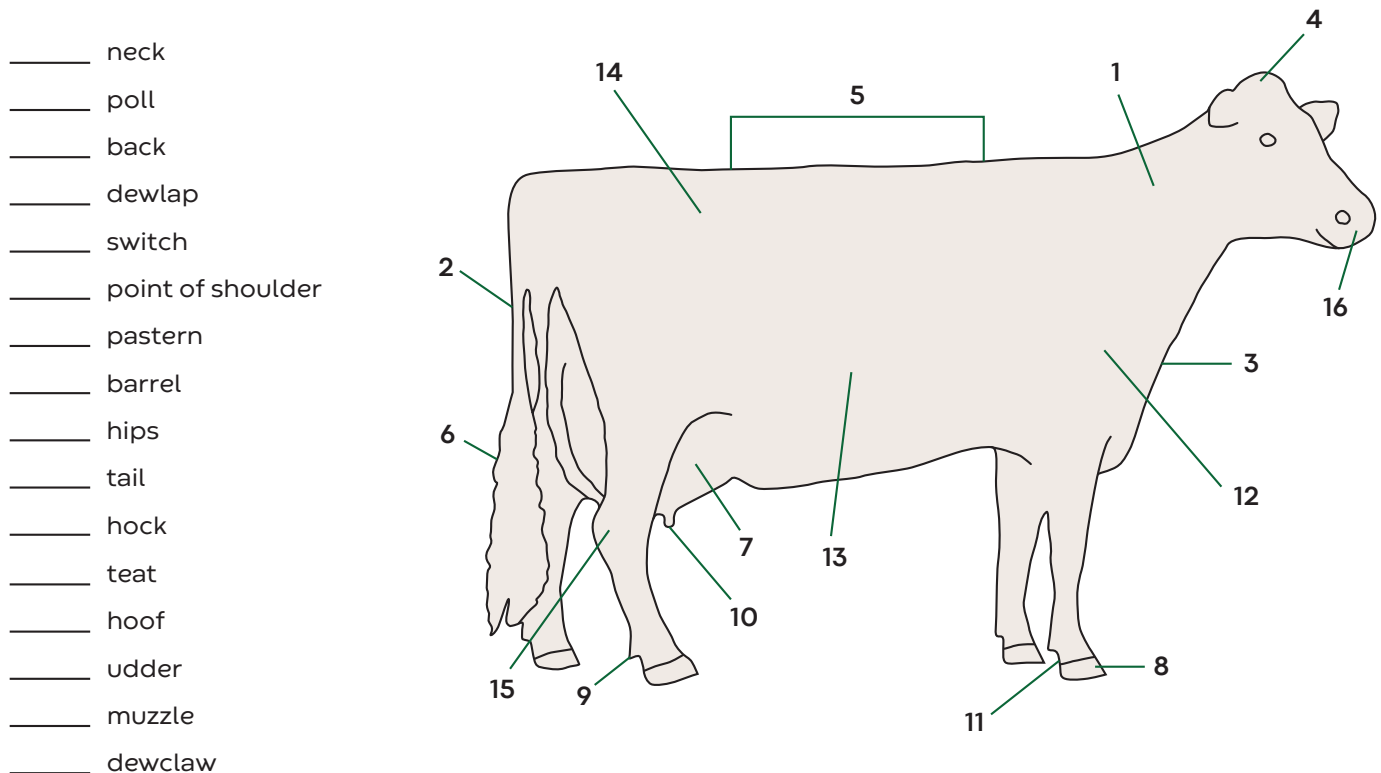
Fun facts

- About 73% of calcium available in the food supply is provided by milk and milk products.
- To read more fun facts about cows visit “35 Fun Facts About Dairy” at <https://www.drink-milk.com/wp-content/uploads/2022/06/35-Fun-Facts-About-Dairy-2022.pdf>.
- DrinkMilk.com’s website offers more dairy education and activities for families at <https://www.drink-milk.com/?s=fun+facts&submit=Search>.

Dairy Anatomy (Level 1)

- » Life Skill: Decision-making
- » SET Ability: Interpret/Analyze/Reason
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Collaboration skills, Teamwork skills

Instructions: Match the numbers on the picture of the cow to the parts below.



Breeds of Cows—Bovine

For many years there were 6 major breeds of dairy cows in the United States. Dairy cattle first appeared in America in around 1492 with the early explorers. They were used as multi-purpose animals providing milk, meat and draft (pulling) ability. It was in the late 1800s when more people moved into cities and towns that farmers found larger markets for milk and dairy products and this was when the six breeds were imported in their greatest numbers. In later years, Red & Whites would join the list to become the seventh major recognized dairy breed.

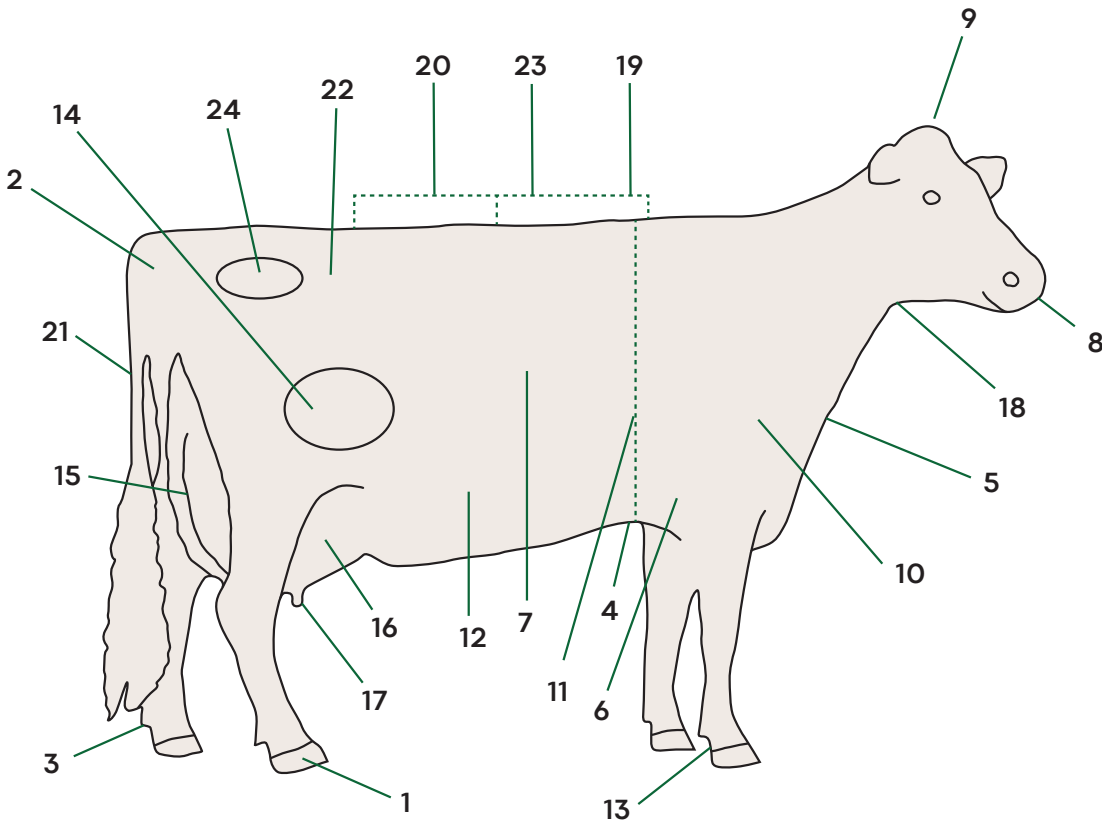
Instructions: Match the breed names with their country of origin.

- | | |
|-------------------------|---------------------|
| _____ Ayrshire | A. Netherlands |
| _____ Brown Swiss | B. Isle of Jersey |
| _____ Guernsey | C. Scotland |
| _____ Holstein | D. Isle of Guernsey |
| _____ Jersey | E. England |
| _____ Milking Shorthorn | F. Switzerland |

Dairy Anatomy (Level 2)

- » Life Skill: Decision-making
- » SET Ability: Inquiry skills, Collaboration
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Critical thinking skills

Ask students to match the numbers on the picture of the cow to the parts below.



- | | |
|-------------------------|------------------|
| _____ chest floor | _____ thurls |
| _____ pins | _____ back |
| _____ neck | _____ hips |
| _____ poll | _____ tail |
| _____ chine | _____ dewlap |
| _____ teat | _____ stifle |
| _____ elbow | _____ fore udder |
| _____ point of shoulder | _____ rear udder |
| _____ heart girth | _____ pastern |
| _____ barrel | _____ dewclaw |
| _____ ribs | _____ hoof |
| _____ loin | _____ muzzle |

Learn more about dairy cow anatomy using the Unified Dairy Scorecard:

The Unified Dairy Scorecard is a tool developed by the Purebred Cattle Association (PDCA) to give specific values to a cow's Frame, Dairy Strength, Rear Feet and Legs, and Udder.

Instructions: Each area is given a maximum point value on the Unified Dairy Scorecard.

Go to <http://www.purebreddairycattle.com> to learn more about the PDCA and view the scorecard, then fill in the blanks below with the name of the area on the cow and highest possible score in the category.

Frame: The skeletal parts of the cow, with the exception of the rear feet and legs. _____

Dairy Strength: A combination of dairyness and strength which supports production and longevity. _____

Rear Feet and Legs: Evidence of mobility, rear view, side view, and thurl position. _____

Udder: Major consideration is given to those traits that contribute to high milk yield and a long productive life. _____

TOTAL %

Dairy Health

- » Life Skill: Decision-making
- » Science skill: Interpret/Analyze/Reason, Problem solving
- » Vermont Science Standard: 7.1 Scientific Method
- » Employment / Career Skill: Critical Thinking



Keeping animals healthy is a key part of any successful dairy operation. Many farms have a veterinarian they work with on a regular basis and when emergencies happen.

Some farmers use pedometers on their cows to monitor movement. By checking a computer or an app on their phone, the farmer can determine which cows are moving less than normal, an indicator to take a closer look to determine if there are foot problems or other health issues.

The decrease in movement often happens before the farmer notices a potential problem. An increase in movement can also be determined by checking the computer or phone app, and may be an indication of estrus.

Diagnosis Matching

Instructions: Ask students to match the term with the diagnosis description. Students may have to research a term before making their selection(s).

- | | |
|-----------------|--|
| A. Ringworm | _____ Examine and determine what is wrong |
| B. Pinkeye | _____ An instrument for measuring temperatures |
| C. Warts | _____ Redness and inflammation of the lining of the eye |
| D. Lice | _____ A device used to give cattle boluses |
| E. Scours | _____ The measurement of blood surging through an artery |
| F. Thermometer | _____ Infectious skin disease caused by a fungus |
| G. Pulse | _____ A small growth on the skin |
| H. Foot Rot | _____ Causes lameness in an animal |
| I. Balling Gun | _____ An individual who visits a farm for animal health |
| J. Veterinarian | _____ Manure that is of watery consistence |
| K. Diagnose | _____ An external parasite |

Additional discussion points

Ask students to consider how a doctor examines a toddler who the parent has brought in because they are not eating and compare that to how a veterinarian would examine a cow who the farmer is concerned about because she is not eating. What steps taken would be similar and what would be different? Create a chart to show students' ideas.

Manure Management

- » Life Skill: Decision-making, Teamwork
- » SET Ability: Inquiry skills, Collaboration
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Collaboration skills, Teamwork skills



Vermont dairy farmers must comply with laws and regulations concerning how cow manure is stored and utilized on their farms. When properly stored, manure can be added to soils through spreading or injection, or be composted and added to the soil later. Manure can provide valuable nutrients for plant growth and soil health, and reduce the need to purchase commercial, organic or other types of fertilizer.

In this lesson, students will gain an understanding of the volume of manure produced daily by a single cow.

Facts Needed To Calculate Manure Production

(Resource: Learning About Dairy... A Resource for the 4-H Dairy Project)

- The average cow produces 89 pounds of manure per day per 1,000 pounds of live weight.
- This is approximately 10 gallons of manure per 1,000 pounds weight or 1.32 cubic feet.
- Manure is 87.3% water.

Questions to consider using the facts above

- If a large mature cow weighs 1,700 pounds, how much manure would she produce per day?
- Your herd has 80 cows this size. How much manure would your herd produce for the month of December?

How students should arrive at the correct answer

- The average cow produces 89 pounds of manure per day for every 1,000 pounds of body weight, so to calculate how much manure a 1,700-pound cow would produce, follow these steps:
- $1,700 \div 1,000 = 1.7$
- $1.7 \times 89 = 151.3$ pounds of manure per day / single 1,700-pound cow
- 151.3×80 (cows in the herd) = 12,104 pounds of manure per day.
- $12,104 \times 31$ (days in December) = 375,224 pounds divided by 2,000 (1 ton) = 187.6 tons of manure!

You can also calculate how much of the 375,224 pounds of manure is water. Removing the water would lessen the needed storage required considerably.

Ask students to do the math to complete the chart below. Remember the facts about each breed needed to calculate manure production**:

1. The average cow produces 89 pounds of manure per day per 1,000 pounds of live weight.
2. This is approximately 10 gallons of manure per 1,000 pounds weight or 1.32 cubic feet.
3. Manure is 87.3% water.

BREED**	AVERAGE LIVE WEIGHT	POUNDS OF MANURE PRODUCED PER DAY	GALLONS OF MANURE PRODUCED PER DAY	GALLONS OF WATER IN MANURE PER DAY
Ayrshire	1,200 lbs.			
Brown Swiss	1,500 lbs.			
Guernsey	1,100 lbs.			
Jersey	1,000 lbs.			
Holstein	1,500 lbs.			
Milking Shorthorn	1,250 lbs.			
Red and White	1,400 lbs.			

Additional discussion points

- After students have completed the chart discuss what other factors might impact manure storage space needed on a Vermont dairy farm.
- Consider the impacts of weather, climate, and the types of crops grown on the farm might have on the design of a manure storage structure for a Vermont dairy.
- What else might a farmer add to their manure pit that could influence needed size?

** Resource: <https://www.dairymoos.com/breeds-of-dairy-cattle/>

Water Quality and Manure Management

- » Life Skill: Critical thinking, Decision-making
- » SET Ability: Inquiry skills, Critical thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Decision-making

The Required Agricultural Practices (also referred to as RAPs)¹ are a set of standards which all types and sizes of farms² in Vermont must follow to reduce the impact of agricultural activities on water quality.

The RAPs include required practices and management strategies, some of which apply to all farms and some of which are specific to certain sizes of operations or to certain environmental factors.

Ask students to read the Vermont Department of Agriculture, Food and Markets “A Summary of the Required Agricultural Practices”³. Then ask them to write each of the following definitions and give an example that pertains to Vermont dairy farms.

Example: *Buffer zone: An area of perennial vegetation between the cropped area and waterway, ditch, or road.*

- Compost:
- Cover crop:
- Erosion:
- Groundwater:
- Nonpoint source pollution:
- Point source pollution:

Additional discussion points

- Why is it important for Vermont dairy farmers to address water quality issues and implement conservation practices?

Refer to the RAPs for information about spreading regulations to answer this question:

- Vermont law requires that spreading of manure not be done between what dates?

Sources: Vermont Department of Agriculture, Foods and Markets

¹ <https://agriculture.vermont.gov/rap>

² https://agriculture.vermont.gov/sites/agriculture/files/documents/Water_Quality/FarmSizeClass.pdf

³ https://agriculture.vermont.gov/sites/agriculture/files/documents/Water_Quality/RAPsummaryPDF.pdf

Soil Sampling

- » Life Skill: Decision-making, Planning / organizing, Keeping records
- » Science skill: Inquiry skills
- » Vermont Science Standard: MS-ESS3-1 Uneven Distribution of Earth's Resources
- » Employment / Career Skill: Management skills, Problem-solving skills

Ask students to read the following information from the “Soil Sampling” factsheet by Dr. Heather Darby, UVM Extension Agronomy Specialist.

A soil test is the only practical way of telling how much fertilizer is needed for a given field. However, the reliability of a soil test is only as good as the sample you submit. The small amount of soil in the sample bag you send to the Agricultural Testing Lab must represent the entire area to be fertilized.

When taking the soil sample, avoid unusual areas, such as those where fertilizer or lime have spilled. Take samples before lime, fertilizer, or manure are applied. Use only clean equipment for collecting soil samples. Using a soil probe is the easiest way to get a good soil sample.

Getting Started

1. In order to receive your recommendations early enough to use them for planning the next crop season, it is best to take samples in the fall.
2. Use a sampling probe or auger, available from mail order catalogs and garden or farm supply outlets. Either of these are the best tool for sampling and a necessity if sampling large numbers of fields. You may be able to borrow a probe from your local USDA-NRCS (U.S. Department of Agriculture Natural Resources Conservation Service) or Extension office.
3. The area to be sampled should be as uniform as possible in terms of soil type, cropping and fertilization history. For practical purposes, it should be an area you expect to fertilize as a unit. Take at least 15 soil cores or borings for each composite sample on a field of a maximum size of 20 acres. If a field is more than 20 acres, take two complete samples (30 borings).
4. Insert the probe or auger into the soil to plow depth (at least 6 inches) for hay and other perennial crops. Insert the probe to the plow depth (usually 6–10 inches) for annual crops such as corn. In general, do not sample an area of a field which varies widely from the rest of the field in color, fertility, slope, texture, drainage, or productivity.
5. Discard any plant material and mix soil cores in a clean plastic bucket. Be sure to mix samples well.
6. Take about 1 cup of the mixed soil cores and place in a plastic bag.
7. Identify the bag with your name, field name, and sample number.
8. Record the field, sample location, and date in your records.
9. Fill out the soil test questionnaire and place it in an envelope with the plastic bag along with a check to pay for the testing. If submitting multiple samples, include one check for the total being tested. The sample(s) can be taken directly to the UVM lab or sent to the address below. **Results are normally returned in two weeks.**

If you need a copy of the soil test form visit http://pss.uvm.edu/ag_testing. Mail the soil test and form to University of Vermont Agricultural & Environmental Testing Lab, Jeffords Hall, Room 262, 63 Carrigan Drive, Burlington, VT 05405-1737.

Soil Sampling Activity

- » Life Skill: Decision-making, Critical thinking
- » SET Ability: Inquiry skills, Collaboration
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Collaboration skills, Organizational skills

Using the information from the “Soil Sampling” factsheet, ask students to complete the following activity and questions. Each student needs to look at the field map below and select two fields where they would take soil borings. Write an X on each field. Have students discuss as a group how/why they decided to choose the fields and answer these questions:



1. How many total borings would you take on field 1?
2. What types of areas would you avoid taking borings from?
3. What information would you record on the sample bag?

Additional discussion points:

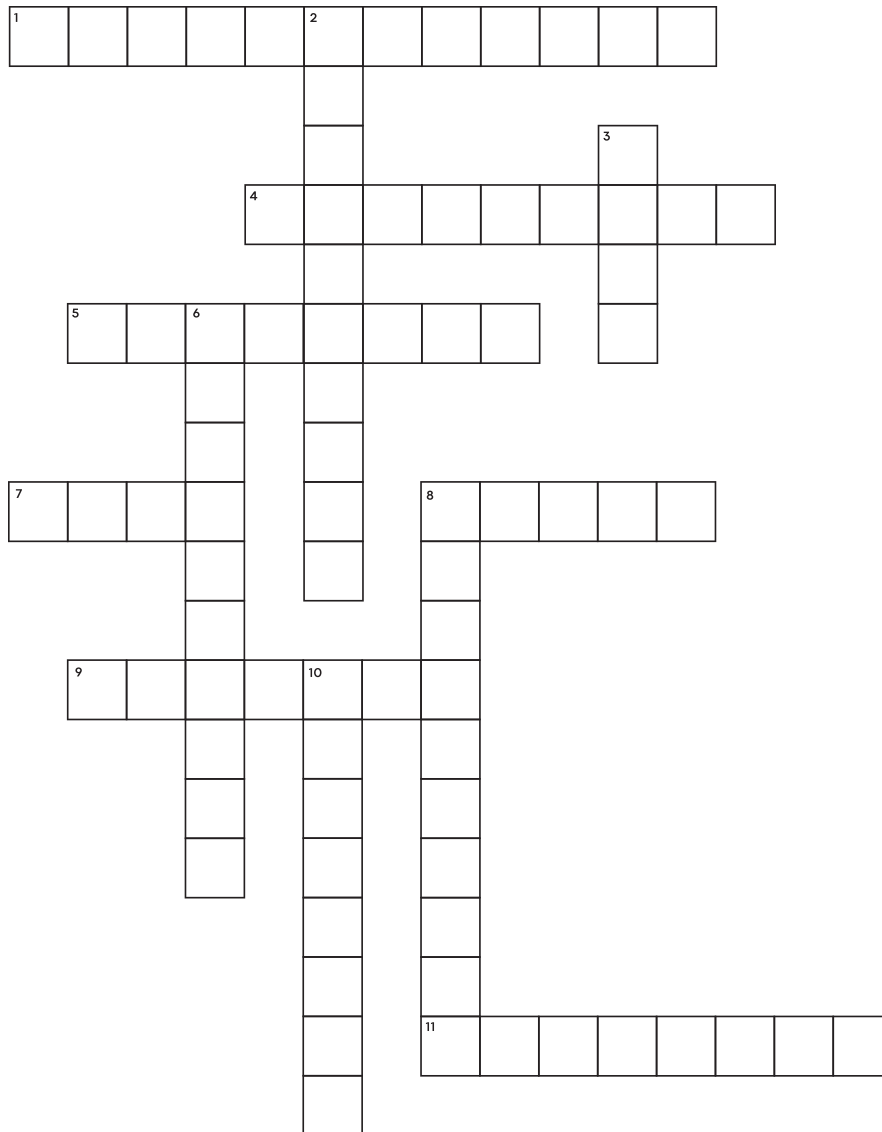
Take a closer look at the map and discuss areas where you would want to avoid taking soil samples. Discuss why having buffer areas (areas that are not spread with manure) are important. Read more about buffer areas in the Vermont Department of Agriculture, Foods and Markets Required Agricultural Practices materials at <https://agriculture.vermont.gov/rap>.

Soils Crossword Puzzle

- » Life Skill: Decision-making, Critical thinking
- » SET Ability: Inquiry skills
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Problem-solving

Ask students to complete the crossword puzzle on the next page. Encourage students to use the Glossary and additional online resources to find answers.

(Puzzle on next page...)



Across

1. A measure of the rate at which water can pass through soil
4. Soil element critical for plant health and growth, seen as K on the soil test
5. A group of microscopic life forms that includes bacteria, archaea, viruses, and eukaryotes like fungi
7. Amendment added to soil to increase the soil pH
8. Tool used to take soil borings
9. Another name for the multiple soil cores taken from a field for analysis
11. Process of collecting soil borings for analysis (2 words)

Down

2. Person who studies soil management and crop production
3. Slang word for soil
6. Plants used to reduce soil erosion after a harvest (2 words)
8. High levels of this nutrient in run-off can cause algae blooms
10. Legume plants have tiny root nodules that can fix this nutrient

Dairy Foods

(Part 1)

- » Life Skill: Critical thinking
- » SET Ability: Inquiry skills, Critical thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Creative thinking, Decision-making



Ask students to place the number next to the corresponding definition. Students should research any unfamiliar terms.

- | | |
|-------------------|--|
| 1. Cottage Cheese | _____ Enzyme used in cheese making |
| 2. Yogurt | _____ A milk protein |
| 3. Casein | _____ By-product of cheese making |
| 4. Rennet | _____ Cheese made from goat's milk |
| 5. Pasteurization | _____ Acid that gives milk a sour taste |
| 6. Homogenization | _____ Milk is churned into this product |
| 7. Chevre cheese | _____ Cheese made from sheep's milk |
| 8. Low-fat milk | _____ Coagulated mixture of milk and eggs |
| 9. Roquefort | _____ Cultured milk product |
| 10. Butter | _____ Soft cheese made with a surface mold |
| 11. Blue cheese | _____ Curds of milk proteins; a soft cheese |
| 12. Lactic acid | _____ Unpasteurized milk |
| 13. Raw milk | _____ Milk that has been heated to 160° F for 30 minutes |
| 14. Custard | _____ Milk that is 1 to 2% butterfat |
| 15. Whey | _____ Process of breaking up fat particles |

Fun Facts

- The average American consumes 40.2 pounds of cheese per year.
- The favorite flavor of ice cream in the United States is vanilla.

Additional discussion points

- Students can survey classmates and ask their favorite flavor of ice cream then make a bar or pie graph to present the results.

Dairy Foods

(Part 2)

- » Life Skill: Critical thinking
- » SET Ability: Inquiry skills, Critical thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Creative thinking, Decision-making



Ask students to place the number next to the corresponding definition. Students should research any unfamiliar terms.

- | | |
|----------------------|--|
| 1. Bulk tank | _____ First milk a cow produces after giving birth |
| 2. Butter | _____ Dairy product made from the fat protein of churned cream |
| 3. Calcium | _____ Hard Italian cheese often grated and served on spaghetti |
| 4. Colostrum | _____ Powdery outer coating on cheese that forms during aging process |
| 5. Rind | _____ Breaking up of fat particles to keep cream from rising to the top |
| 6. Cud | _____ The process of aging cheese |
| 7. Homogenization | _____ Dairy product used in dips and on baked potatoes |
| 8. Ice cream | _____ Nutrient in milk important to bone building |
| 9. Mozzarella | _____ Globbs of feed regurgitated from a cow's first stomach compartment |
| 10. Cheese affinage | _____ Stainless steel structure where milk is stored |
| 11. Processing plant | _____ Facility where milk is prepared before going to retail outlets |
| 12. Sour cream | _____ Stringy cheese commonly used on pizza |
| 13. Swiss cheese | _____ Frozen dairy treat |
| 14. Parmesan | _____ Hard cheese with holes/eyes resulting from carbon dioxide released during the maturation process |

Fun Facts

- Milk contains more nutrients than any other single food.
- After hay and grain are eaten by a cow, it takes twelve hours to convert the energy from the feed into milk.
- It takes 10 pounds of milk to make 1 pound of Cheddar cheese.

Dairy Foods Word Search

- » Life Skill: Learning to learn
- » SET Ability: Inquiry skills
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Creative thinking

Ask students to complete the word search puzzle on the next page.

(Puzzle on next page...)

Bonus Activity: Make a Purple Cow!

Ingredients:

- 2 cups vanilla ice cream
- 6-ounce can frozen grape juice concentrate
- 1-1/2 cups milk

Put all ingredients together in a blender. Mix and enjoy.

Find the dairy foods words below in the puzzle. Words may be horizontal, vertical, or diagonal. They may also be spelled right-to-left or from bottom-to-top. (Note: Spaces between words do not appear in puzzle.)

J	O	S	I	L	N	B	K	I	I	T	C	K	X	P	Z	E	E	L	L
R	K	B	C	X	P	U	U	J	U	V	R	M	A	N	S	K	A	A	L
U	Q	F	E	F	N	M	W	T	B	T	R	S	Z	D	A	Y	K	L	G
E	L	B	C	W	U	K	Y	H	T	R	T	P	D	H	K	D	V	L	X
A	Z	K	R	W	H	S	V	A	V	E	P	Z	S	J	R	M	F	E	K
W	M	X	E	G	G	N	O	G	U	J	R	K	W	D	K	A	Q	R	P
T	S	R	A	N	E	E	I	R	M	M	L	F	M	Y	B	K	X	A	N
A	Q	B	M	S	T	O	I	S	F	I	J	V	A	B	W	R	L	Z	S
E	L	I	E	Q	E	Z	W	H	M	L	S	V	A	T	L	E	D	Z	O
B	U	E	U	K	A	S	G	M	H	T	P	A	U	V	X	T	O	O	S
W	H	O	I	T	G	R	E	D	Z	I	G	B	B	E	F	T	U	M	F
C	Y	P	I	U	W	E	H	E	P	K	N	A	T	K	L	U	B	U	W
L	F	O	I	R	X	I	U	E	H	T	G	R	V	V	P	B	I	R	A
E	N	Q	E	S	W	N	L	Y	G	C	R	U	L	H	G	C	V	J	I
Z	Y	E	A	A	G	I	U	W	E	E	M	U	M	X	Y	Q	B	K	X
N	J	X	I	P	N	H	T	B	W	G	W	A	G	W	C	Y	S	W	I
K	L	I	M	E	T	A	L	O	C	O	H	C	E	O	H	T	C	M	M
O	A	Y	O	B	O	B	D	A	B	A	H	R	U	R	Y	E	X	P	Z
H	G	I	S	Q	V	Z	W	E	S	D	I	I	R	H	C	B	Y	U	R
S	O	U	R	C	R	E	A	M	I	Z	X	T	Y	S	H	D	J	B	T

BULK TANK
CHEESE
EGGNOG
MOZZARELLA
SOUR CREAM

BUTTER
CHOCOLATE MILK
ICE CREAM
PASTEURIZATION
WHEY

BUTTERFAT
CREAM CHEESE
MILKSHAKE
PIPELINE
YOGURT

Dairy Crossword

- » Life Skill: Learning to learn
- » SET Ability: Inquiry skills
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Creative thinking

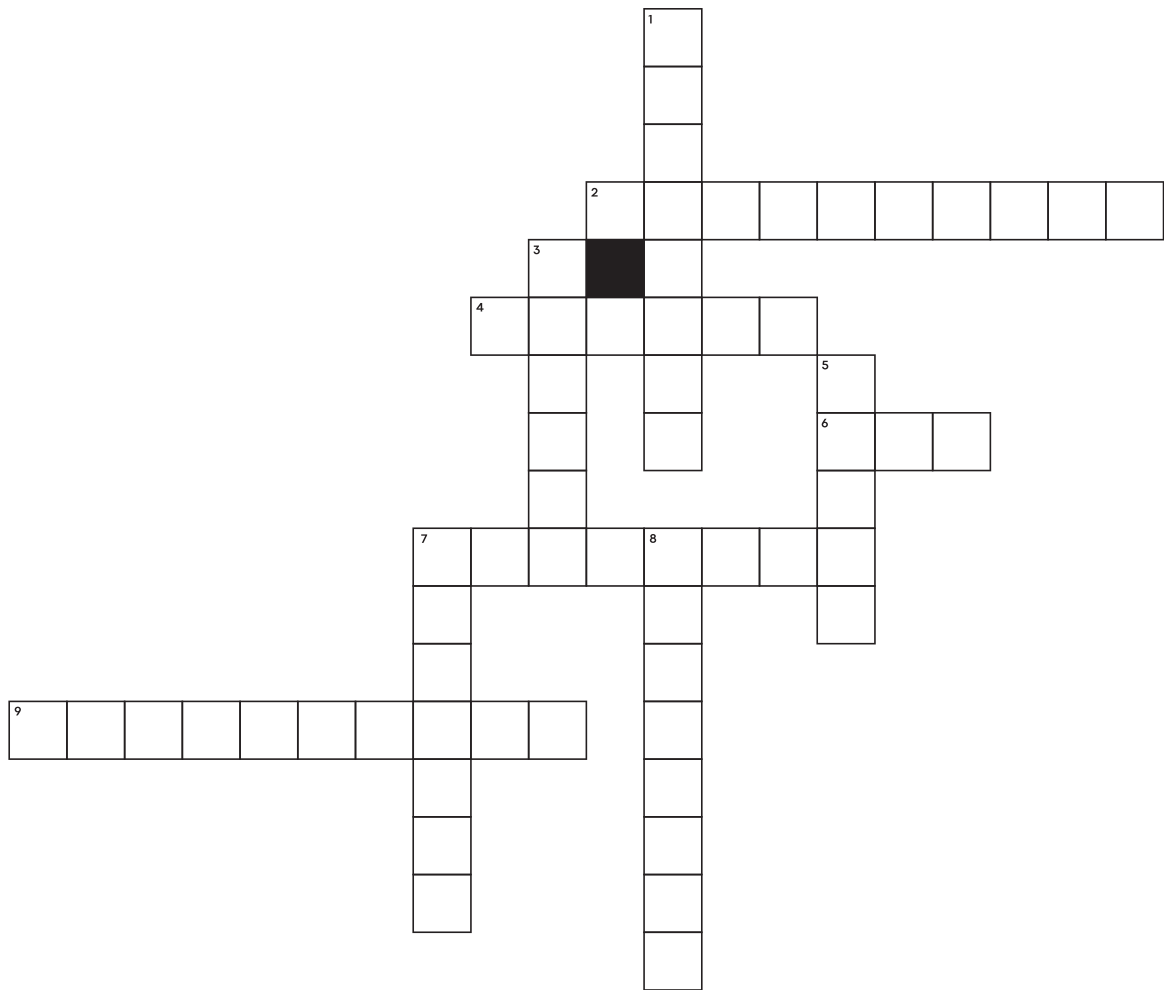
Ask students to complete the crossword puzzle on the next page.

(Puzzle on next page...)

Additional Discussion Points

Cows have a four-compartment stomach and the human stomach has one compartment. Ask students to create a chart and discuss some of the feeds that cows can digest which people cannot.

Cow numbers from the 2020 Census of Agriculture, <https://www.nass.usda.gov/AgCensus/>.



Across

2. A breed of large brown cows (2 words) – originated in the Alps
4. Smallest dairy breed
6. A cow's female parent
7. A hardy red and white breed of medium stature
9. An annual crop that is chopped and is major feed in a cow's diet (2 words)
 Hint: First word – people like to eat it off the cob
 Hint: Second word – the resulting product when the first word is fermented

Down

1. A breed of cow that gives golden milk
3. A term for a yearling female
5. A term for a cow's mammary gland
7. A legume grown for hay or silage
8. A black and white breed of cow

Let's Make Butter

- » Life Skill: Learning to learn
- » SET Ability: Inquiry skills
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Creative thinking skills

In this activity, students will make butter from heavy cream.

Supplies and ingredients needed:

- Pint jars with lids — 1 per student
- 6-inch square of cheesecloth — 1 per student
- Rubber bands, large enough to secure cheesecloth over jar
- Heavy cream — 1 cup per student
- Salt — optional
- Plain crackers for tasting

Instructions:

- Measure 1 cup heavy cream into each pint jar.
- Be sure to secure lids tightly.
- Shake jars; notice little bits of butter forming on the sides of the jar.
- Continue shaking until there are curds of butter and the liquid whey.
- Remove top from jar and secure a piece of cheesecloth over the jar opening with a large rubber band.
- Turn jar over an empty bowl to catch the whey as it drains off the butter.
- When done draining, remove cheesecloth and pour remaining butter into a bowl.
- Optional: Add salt to taste, mixing well to distribute salt throughout the butter.
- Spread on crackers and enjoy.

Additional Discussion Points

- Research how butter is made commercially and what the by-product whey can be used for.

Let's Make Yogurt

- » Life Skill: Learning to learn
- » SET Ability: Inquiry skills
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Creative thinking

Many people enjoy Greek yogurt with fruit or granola, with Vermont maple syrup, or plain. Students can make their own Greek yogurt with this simple recipe and a few minimal ingredients.

Ingredients

- ½ gallon whole or 2% milk
- 8 ounces plain live culture yogurt (for the “starter”)
- Slow cooker
- Thermometer
- Cheesecloth
- Colander

Place the entire half gallon of whole milk in the slow cooker. Place on “high” heat with the lid on. Heat to 180° F. This step will take 2 to 3 hours. Check the temperature with the thermometer and when milk reaches 180° F, turn off the heat.

Allow milk to cool without stirring. Cool to 110° F. This will take a few hours. When milk has cooled to 110° F, gently fold 8 ounces of plain live-culture yogurt into the milk.

“Folding” is the process of gently mixing in an up and down motion rather than stirring back and forth.

Replace lid and cover with a large towel. Make sure slow cooker is off and not plugged in. Place in a warm area, free from drafts, and let the mixture sit for approximately 12 hours or overnight. Do not stir during this time and leave it undisturbed.

The warm environment is necessary for the milk to thicken and form yogurt. After 12 hours, line a colander with cheesecloth. Place the colander over a large glass bowl. Pour the yogurt into the lined colander, allow to drain for several hours. The longer the yogurt is strained the thicker it will be. The liquid that is strained off is whey and may be used in baking, shakes, etc.

Store the yogurt in a covered glass container in the refrigerator for up to two weeks. When serving, top with granola or fruit for a delicious treat. Use a cup of this yogurt as a starter for your next batch.

Fun Fact

- In 2020, yogurt consumption in the United States was 4,535 million pounds. Source: USDA, <https://www.ers.usda.gov/data-products/dairy-data.aspx>.

PART 2: DAIRY INDUSTRY CAREERS

Animal Care / Health Careers

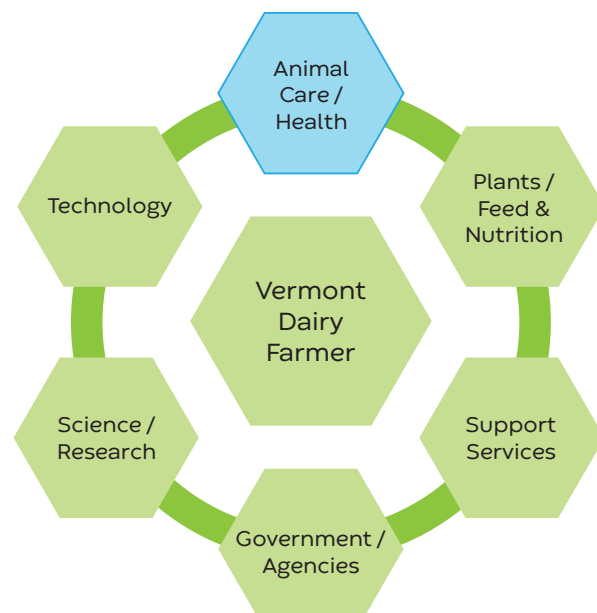
- » Life Skill: Planning/organizing, Goal setting
- » SET Ability: Design thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Decision-making

Ask students to consider these questions when deciding if a career in animal care/health:

- Do you enjoy working with livestock?
- Are you willing to work weekends, evenings, and holidays?
- Do you enjoy traveling to different farms daily?

Some careers in animal care/health include:

- Veterinarian
- Veterinary Assistant/Technician
- Artificial Inseminator
- Veterinary Pharmaceutical Sales/Representative



Suggest that students research careers in animal care/health by completing the following table:

CAREER	DOES THIS POSITION REQUIRE POST-SECONDARY EDUCATION?	APPROXIMATE COST OF EDUCATION	AVERAGE ANNUAL SALARY	SOMETHING THAT INTERESTS YOU ABOUT THIS CAREER
Veterinarian				
Veterinary Assistant				
Artificial Inseminator				
Veterinary Pharmaceutical Sales/Representative				

Digging a Little Deeper — Animal Care/Health Careers: Large Animal Veterinarian

- » Life Skill: Communications
- » SET Ability: Critical thinking
- » Vermont Science Standard: MS-LS1-8
Information Processing
- » Employment / Career Skill: Active Listening

Many students dream of becoming a large animal veterinarian. Veterinarians work closely with dairy farmers and are an important resource for any dairy farm system.

Many veterinarians in Vermont are part of a group where multiple veterinarians work for a single service. This allows for time off and less on-call time at night or on weekends.

For this lesson, students will need to contact a veterinarian who works with dairy animals to conduct an interview. When contacting the office, students should explain that they are doing potential career research and would like to speak to a veterinarian for approximately 10 minutes. Remind students to be polite and prepared, and to practice the questions before conducting the actual interview. When students have completed the interviews, they should share and compare their results. The statements and questions are:



1. Introduce yourself and explain that you are doing research into a potential career.
2. Where did you go to college and what was your undergraduate degree?
3. Where did you go to veterinary school and how many years did you study there?
4. How many years have you been a practicing veterinarian?
5. What do you enjoy most about your job?
6. What do you find most challenging about your job?
7. How often do you have a day off?
8. How many hours do you work in the average week?
9. Can you tell me about one of your most unusual calls?
10. What advice would you give to someone who is considering becoming a large animal vet?
11. Is doing a ride-along a possibility for a young person considering becoming a veterinarian?
12. Thank them for their time.

Plants, Feeds, and Nutrition Careers

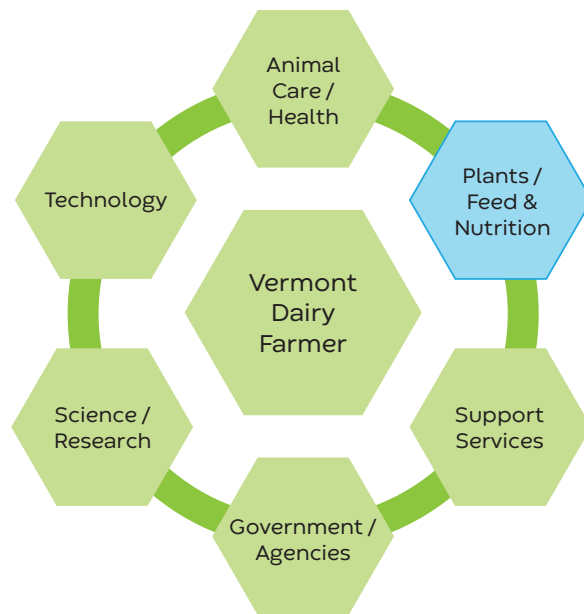
- » Life Skill: Planning/organizing, Goal setting
- » SET Ability: Design thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Decision-making

Ask students to consider these questions when deciding if a career in plants, feed, and nutrition:

- Do you enjoy working outside?
- Would you like helping farmers increase production through improved animal nutrition?
- Do you like sales?

Some careers in plants, feed, and nutrition include:

- Agronomist
- Crops Manager
- Feed Company Sales Representative
- Dairy Nutritionist
- Nutrient Management Specialist



Do the research

Ask students to think about careers in plants, feed, or nutrition and then complete the table below. They can research career opportunities online or ask someone they know who has knowledge about the selected career.

CAREER	DOES THIS POSITION REQUIRE POST-SECONDARY EDUCATION?	APPROXIMATE COST OF EDUCATION	AVERAGE ANNUAL SALARY	SOMETHING THAT INTERESTS YOU ABOUT THIS CAREER
Agronomist				
Crops Manager				
Feed Company Sales Representative				
Dairy Nutritionist				
Nutrient Management				

Digging a Little Deeper — Plants, Feed and Nutrition Careers: Crops Manager

- » Life Skill: Communications
- » SET Ability: Critical thinking
- » Vermont Science Standard: MS-LS1-8
Information Processing
- » Employment / Career Skill: Active Listening

The crops manager on the dairy farm may be the farmer or it may be someone who works for the farm who is specifically responsible for the crops grown on the farm.

The crops manager may work closely with the farmer to determine what specific annual and perennial crops will be grown and how they will fit into the various rations. A crops manager must know when to plant, harvest, and how to store each crop to ensure optimum quality and nutritional value. The crops manager must know the farm's nutrient management plan and keep records to ensure that the farm stays within the boundaries specified in the nutrient management plan.



For this lesson, students will need to contact a dairy farmer and ask if they manage their own cropping decisions or if the farm has a specific crops manager who could be interviewed for approximately 10 minutes. Remind students to be polite and prepared, and to practice the questions before conducting the actual interview. When students have completed the interviews, they should share and compare their results. The statements and questions are:

1. Introduce yourself and explain that you are doing research into a potential career.
2. Did you go to college to learn about crop management or learn on the job?
3. How many years have you been in your current position?
4. What do you enjoy most about your job?
5. What do you find most challenging about your job?
6. What types of crops are grown on this farm?
7. Do you supervise other farm employees? If yes, how many?
8. Can you tell me how the nutrient management plan influences the cropping decisions you make?
9. Can you tell me about what you do in the winter months?
10. What advice would you give to someone who is considering becoming a crops manager?
11. Thank them for their time.

Farm Support Services Careers

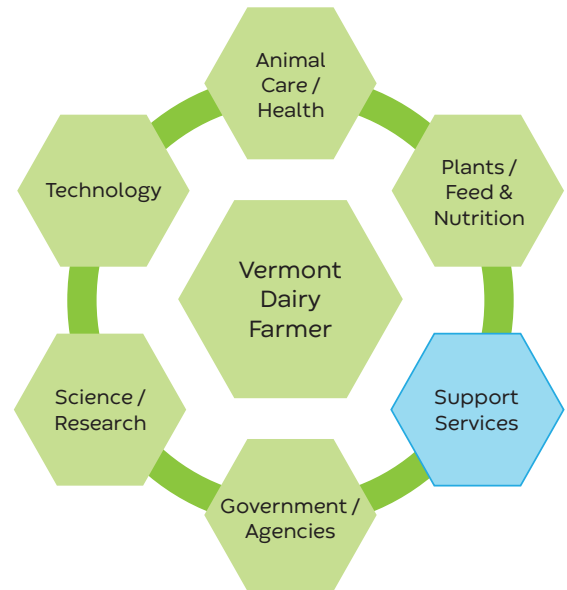
- » Life Skill: Planning/organizing, Goal setting
- » SET Ability: Design thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Decision-making, People skills

Ask students to consider these questions when deciding if a career in farm support services:

- Do you like to work with a variety of people each day?
- Do you like driving truck or working with people?
- What work schedule do you prefer?

Some careers in farm support services include:

- Diesel Mechanic
- Farm Equipment Sales
- Farm Equipment Repairs/Service/Mechanic
- Milk Hauling
- Farm Lender/Loan Officer/Financial Advisor
- Farm Store Employee



Do the research

Ask students to think about careers in farm support services and then complete the table below. They can research career opportunities online or ask someone they know who has knowledge about the selected career.

CAREER	DOES THIS POSITION REQUIRE POST-SECONDARY EDUCATION?	APPROXIMATE COST OF EDUCATION	AVERAGE ANNUAL SALARY	SOMETHING THAT INTERESTS YOU ABOUT THIS CAREER
Farm Equipment Sales				
Farm Mechanic				
Milk Hauler				
Farm Lender / Loan Officer / Financial Advisor				
Farm Store Employee				

Digging a Little Deeper — Support Services Careers: Diesel Mechanic

- » Life Skill: Communications
- » SET Ability: Critical thinking
- » Vermont Science Standard: MS-LS1-8
Information Processing
- » Employment / Career Skill: Active Listening, People skills

Most diesel mechanics work for machinery dealerships but a few larger farms may also employ on-farm mechanics.

Advances in farm equipment and the use of more robotics and computer programs are helping to advance efficiencies on the farm and are taking diesel and farm mechanics to a new level. AI on farms no longer refers solely to artificial insemination but also Artificial Intelligence — as in robotics, precision agriculture, and more.

As farm equipment becomes more technologically advanced the training for mechanics becomes more focused and may require specialized trainings and tools. Some colleges and trade or tech schools offer special programs with a farm equipment focus.

For this lesson, students will need to contact a local farm equipment dealership, explain that they are doing career exploration and ask if it is possible to interview a mechanic with some specialized training for approximately 10 minutes. Remind students to be polite and prepared, and to practice the questions before conducting the actual interview. When students have completed the interviews, they should share and compare their results. The statements and questions are:

1. Introduce yourself and explain that you are doing research into a potential career.
2. How many years have you been in your current position?
3. Did you go to college to learn about mechanics or learn on the job?
4. How many years have you been in your current position?
5. What do you enjoy most about your job?
6. What do you find most challenging about your job?
7. Have you received specialized training for specific pieces of equipment?
8. What advice would you give to someone who is considering becoming a diesel mechanic?
9. Thank them for their time.



Government Agency Careers

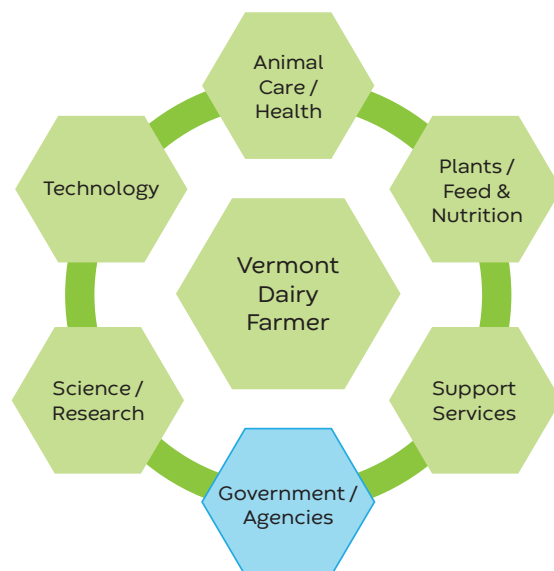
- » Life Skill: Communications, Social skills
- » SET Ability: Critical thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Active listening, Management skills

Ask students to consider these questions when deciding if a career in government agency:

- Would you like to work with farmers and government programs? Do you like to work with conservation issues?
- Are you interested in farm finances?

Some careers in plants, feed, and nutrition include:

- Farm Service Agency Loan Officer
- Crop Insurance sales
- Natural Resource Conservation Specialist
- Agricultural Engineer
- Farm Regulatory Specialist



Do the research

Ask students to think about careers in a government agency role and then complete the table below. They can research career opportunities online or ask someone they know who has knowledge about the selected career.

CAREER	DOES THIS POSITION REQUIRE POST-SECONDARY EDUCATION?	APPROXIMATE COST OF EDUCATION	AVERAGE ANNUAL SALARY	SOMETHING THAT INTERESTS YOU ABOUT THIS CAREER
Farm Service Agency Loan Officer				
Crop Insurance Sales				
Natural Resource Conservationist				
Agricultural Engineer				
Farm Regulatory Specialist				

Digging a Little Deeper — Government Agency Careers: Crop Insurance Sales

- » Life Skill: Communications
- » SET Ability: Critical thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Active Listening, People skills



Crop insurance agents work with farmers to help limit their financial losses in the event that their crop was to be lost due to weather, disease, drought, fire, flooding or insect damage. The salesperson works with the farmer to determine the type and level of coverage needed and the cost for the policy.

For this lesson, students will need to contact a local crop insurance sales agency, explain that they are doing career exploration and ask if it is possible to interview a crop insurance expert for approximately 10 minutes. Remind students to be polite and prepared, and to practice the questions before conducting the actual interview. When students have completed the interviews, they should share and compare their results. The statements and questions are:

1. Introduce yourself and explain that you are doing research into a potential career.
2. How many years have you been in your current position?
3. Did you go to college to learn about crop insurance sales or learn on the job?
4. How many years have you been in your current position?
5. What do you enjoy most about your job?
6. What do you find most challenging about your job?
7. Have you received specialized training?
8. What advice would you give to someone who is considering a career in crop insurance sales?
9. Thank them for their time.

Science and Research Careers

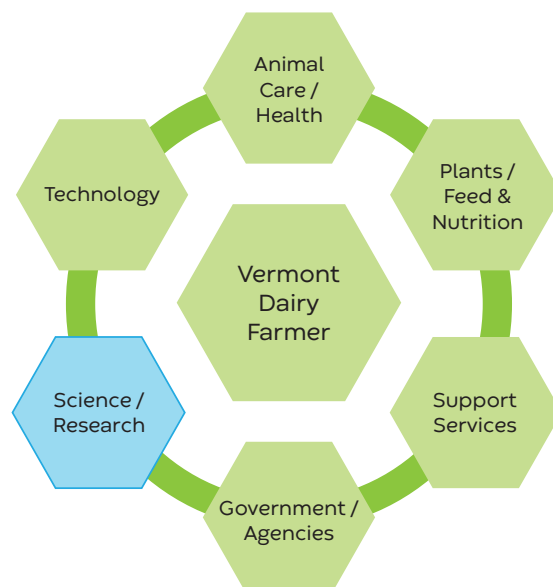
- » Life Skill: Keeping records, Problem solving
- » SET Ability: Critical thinking, Problem solving
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Teamwork, Administrative skills

Ask students to consider these questions when deciding if a career in science and research:

- Do you want to help shape the future of dairy farming?
- Do you like to ask questions and then work to find new or different approaches?

Some careers in plants, feed, and nutrition include:

- Animal Geneticist
- Plant Geneticist
- Soil Scientist
- Genomic Researcher
- Biochemist



Do the research

Ask students to think about careers in science and research and then complete the table below. They can research career opportunities online or ask someone they know who has knowledge about the selected career.

CAREER	DOES THIS POSITION REQUIRE POST-SECONDARY EDUCATION?	APPROXIMATE COST OF EDUCATION	AVERAGE ANNUAL SALARY	SOMETHING THAT INTERESTS YOU ABOUT THIS CAREER
Animal Geneticist				
Plant Geneticist				
Soil Scientist				
Genomic Researcher				
Biochemist				

Digging a Little Deeper — Science and Research Careers: Biochemist

- » Life Skill: Communications
- » SET Ability: Critical thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Active Listening, People skills

Biochemistry is a broad field which includes studying how genetics will be a factor in future generations of plant and animal production. A biochemist may work to develop new strains of seeds that are disease resistant or that are higher yielding. An animal biochemist studies chemical reactions within animals. They may work on metabolism/nutrition, drug development, studying cellular reactions to disease and more — it is a vast field.

For this lesson, students will need to contact a biochemist, explain that they are doing career exploration, and ask if it is possible to interview them for approximately 10 minutes. Remind students to be polite and prepared, and to practice the questions before conducting the actual interview. When students have completed the interviews, they should share and compare their results. The statements and questions are:



1. Introduce yourself and explain that you are doing research into a potential career.
2. How many years have you been in your current position?
3. Where did you go to college and what was your undergraduate degree?
4. How many years did you study to become a biochemist?
5. How many years have you been in your current position?
6. What do you enjoy most about your job?
7. What do you find most challenging about your job?
8. What advice would you give to someone who is considering becoming a biochemist?
9. Thank them for their time.

Dairy Technology Careers

- » Life Skill: Communications, Problem solving
- » SET Ability: Critical thinking, Engineering design
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Active listening, People skills

Ask students to consider these questions when considering dairy technology careers:

- Do you want to help shape the future of dairy farming?
- Are you interested in robotics and artificial intelligence?

Some careers in plants, feed, and nutrition include:

- Robotics Programmer
- Robotic Sales/Repairs
- Meteorologist
- Drone Data Analyst
- Dairy Technical Specialist
- Process Development Engineer
- Information Technology Manager
- Food Engineer



Do the research

Ask students to think about careers in dairy technology and then complete the table below. They can research career opportunities online or ask someone they know who has knowledge about the selected career.

CAREER	DOES THIS POSITION REQUIRE POST-SECONDARY EDUCATION?	APPROXIMATE COST OF EDUCATION	AVERAGE ANNUAL SALARY	SOMETHING THAT INTERESTS YOU ABOUT THIS CAREER
Information Technology Manager				
Drone Data Analyst				
Robotic Milker Sales Representative				
Meteorologist				
Food Processing Engineer				

International Journal of Dairy Technology <https://onlinelibrary.wiley.com/journal>

Digging a Little Deeper — Dairy Technology Careers: Robotic Milker Sales

- » Life Skill: Communications
- » SET Ability: Critical thinking
- » Vermont Science Standard: MS-LS1-8 Information Processing
- » Employment / Career Skill: Active Listening, People skills

A robotic salesperson works as a company representative and is the liaison between the company that manufactures the robotic milking equipment and the farmers they are trying to persuade to purchase the equipment. The person must have outstanding communication skills, be a good listener, and self-motivated. A robotic salesperson must have in-depth knowledge of the items they are offering for sale and keep up to date on changing technologies. They spend the majority of their time working with farmers trying to sell them their line of products.



For this lesson, students will need to contact a representative in robotic milking sales, explain that they are doing career exploration, and ask if it is possible to interview them for approximately 10 minutes. Remind students to be polite and prepared, and to practice the questions before conducting the actual interview. When students have completed the interviews, they should share and compare their results. The statements and questions are:

1. Introduce yourself and explain that you are doing research into a potential career.
2. How many years have you been in your current position?
3. Did you go to college to learn about mechanics or did not learn on the job?
4. How many years have you been in your current position?
5. What do you enjoy most about your job?
6. What do you find most challenging about your job?
7. Have you received specialized training for specific pieces of equipment?
8. What advice would you give to someone who is considering becoming a crops manager?
9. Thank them for their time.

Career Directory

The following directory is only a small sampling of the careers available within the dairy industry. This list is meant as an introduction and to inspire further career exploration.

Ag Economist

Someone who understands the economic activity that happen in agricultural markets, projects trends with markets, understands futures markets and other forward sales options. These individuals have some type of advanced degree in economics.

Agricultural Engineer

A wide field that includes the design of agricultural structures and facilities as well as storage and processing facilities for agricultural products. Another field of agricultural engineering looks at solving problems like making agricultural equipment more energy efficient as well as equipment design.

Agronomist

Someone who studies plants including how they are grown, how to increase yields, and other research pertaining to plants.

Animal Geneticist

Someone who studies the genetic makeup of animals. Geneticists also study animal health in relation to genetics.

Artificial Insemination Technician

Someone who is responsible for the storage, transportation and preparation of semen prior to insemination. This person must have an understanding of bull reports and be able to assist the farmer with sire selections.

Auctioneer

Someone who helps the farmer prepare and plan for a sale, does the advertising, and keeps records pertaining to the sale. Many auctioneering services now also offer online options for buyers and must have a knowledge of such options to maximize sales. Many auctioneers who specialize in farm auctions have an in-depth knowledge of livestock, as well as machinery.

Biochemist

Someone who studies and researches chemical and physical principals of living things. They also study growth, heredity and disease.

Cheese Cave Manager

The person who manages and maintains cheese caves while the cheese goes through the aging process. Maintains the correct environment in the cave to ensure proper aging and quality.

Cheese Maker

Person who takes raw milk through the processing regimen with the final product being cheese ready to market or age.

Class A CDL (Commercial Driver's License) Driver

A person who is licensed to drive trucks of all sizes. Many milk truck drivers as well as over-the-road truckers are Class A certified.

Climatologist

Someone who studies the atmosphere of the earth looking for weather patterns and their affects.

Commodity Sales

Someone who sells agricultural products and commodities on the wholesale or retail level.

Cooperative Field Representative

Someone who works for a cooperative and helps the member farmers identify problems, solve quality issues, and keep the farmers informed of cooperative policies.

Crop Insurance Adjuster

Someone who inspects fields where an insurance claim has been filed. They may be looking for damage caused by insects, disease, weather, or natural disaster.

Crops Manager

Person who determines either independently or in cooperation with the farmer when and type of specific crops to be planted, monitored and harvested.

Custom Cropping Service

This person owns and operates equipment doing specific jobs on dairy farms. Manure spreading, cover-crop planting, mowing, merging, etc. are a few of the jobs that a farmer might hire a custom operator to do. Hiring a custom operator means that the farmer does not have to own certain pieces of equipment thus lowering their equipment investment.

Custom Manure Spreaders

Person who is hired by farmers to agitate and spread manure on land owned or leased by the farmer. Custom manure spreaders must know regulations pertaining to spreading near ditches, waterways and buffer zones. Custom manure spreaders must maintain their equipment and keep records that are part of the farms nutrient management plan.

Dairy Cattle Fitter

Person who prepares animals for shows.

Dairy Farm Calf Manager

This person is responsible for calf care from birth. On larger dairy farms this person may be responsible for all levels of calf care, feeding, vaccination schedules, and cleaning from birth to breeding age. On smaller farms this person may be responsible for the calves from birth until they enter the milking herd. This person must be detail oriented and observant.

Dairy Farm Feeder

Person who works with the nutritionist that formulates the rations. While the nutritionist determines the formula (recipe) it is the feeder who mixes all the ingredients and delivers the rations to the animals.

Dairy Farm Inspector

A farm must pass certain inspections to ship milk. The dairy farm inspector visits individual farms and checks milking equipment, bulk tanks, and facilities for cleanliness and other standards of operation. They record their findings and generate a report for each farm indicating their score and what changes are required.

Dairy Farm Robotic Herd Manager

This person monitors a cow's production using computer software. Must be computer savvy and on-call to respond to calls from the robotic milkers as needed. They are responsible for training new cows to the system and ensuring that cows are being milked at the correct interval. Must also have knowledge of robotic milking system and ability to perform maintenance and repairs.

Dairy Processing Plant Inspector

Person who is responsible for the inspection of dairy facilities to ensure that rules and regulations pertaining to cleanliness, sanitation, storage, temperature, quality, and more are followed to ensure safe and healthy food products are being sold to consumers.

Dairy Product Development Specialist

Person who develops new uses for dairy products to expand the market and demand on a local or global market.

Dairy Technology Sales Representative

Person who sells technology related items like robotic milking units, robotic calf feeding systems, pedometers, computer software, drones, precision cropping systems, and more.

Dairy Nutritionist

Person who reviews feed sample analysis and formulates the rations based on the age, production level desired and analysis of feedstuffs available either on farm or available for purchase.

Diesel mechanic

Person who maintains and repairs farm equipment. The maintenance of some more modern high-tech implements may require special training and specific tools.

Director of Sustainability

This position focuses on member relations with member farmers and dealing with farm audits. The position also looks at the environmental impact from manufacturing operations and works with co-op dairy partners to reduce methane and other byproducts that the dairy produces.

Ecologist

A person who studies living things and the ecosystems they live in. This is a very broad field of study with many sub-categories.

Electrician

Many pieces of equipment on dairy farms and in processing facilities are electrically powered. It is the job of an electrician to ensure that these machines are working safely and efficiently to ensure the safety of the humans and the animals.

Entomologist

Person who studies insects.

Environmental Attorney

A specialized area of law that may include handling legal issues related to water quality, environmental regulations, and climate. They generally work for the protection of the environment.

Extension Dairy Specialist

An employee of a land-grant university who works with dairy farmers to try research-based initiatives which help make changes and improvements.

Farm Equipment Repair/Service

Person who puts machinery together after it arrives from the manufacturing facility and prepared it for sale, or repairs/services equipment owned by others who pay for the repair service.

Farm Equipment Sales

Person who knows the details about a piece of equipment and its specific uses, and who can communicate with prospective buyers about it.

Farm Lender/Loan Officer

Person who understands economics, finance, business operations as well as spreadsheets, inventory lists, and balance sheets and works with farmers to determine credit and loan options that are suitable for their situation.

Farm Regulatory Specialist

Someone who makes sure that farms follow specific guidelines and regulations.

Farm Service Agency Loan Officer

An employee of the United States Department of Agriculture (USDA) Farm Service Agency (FSA) who helps with federal program options.

Farm Store employee

A person who works with the public, stocks shelves, provides customer service, and has a basic understanding of the products they sell.

Feed Company Sales Representative

A person who sells feed, grain, and supplements to farmers. Understands animal nutrition and knows how to balance a ration for the specific age and type of animal.

Financial advisor

A person who works with farmers, examines their financial records, cash flow statements, balance sheets and other financial documents to advise them how to invest or plan for financial stability and security. An understanding of forward contracting, hedging and other financial strategies is also needed.

Food Processor Employee

Any person who works in the processing of food, from a raw product such as milk to a ready to purchase product like cheese. There are many types of food processing employees such as: Laboratory workers, production line workers, workers who maintain the product line equipment, customer relations, sales and more.

Genomic Researcher

A scientist who studies genes and their impact on physical traits. They also study how combinations of genes influence development and growth rates.

Herder/Herdsperson

Person responsible for the health, care, breeding, and milking of the herd. They may supervise other staff such as milkers, feeders, etc. and work with the veterinarian, breeding, nutritionist, crops manager, and others to manage the overall health of the herd.

Ice Cream Manufacturing

Person who works in food production taking condensed cream and producing ice cream ready for market. This industry may include several different jobs including machinery operator, research and development, refrigeration/freezing systems maintenance, and other positions in ice cream manufacturing facilities.

Journalist

Person who gathers information, conducts interviews, writes stories, and works with editors for print media, social media, radio, podcasts, and more.

Hoof Trimmer

Person who travels from farm to farm providing hoof care and trimming, and treatment for foot problems.

Hydrologist

Person who studies how water moves through soil.

Livestock Dealer

Person who is licensed to purchase and sell livestock. They may go from farm-to-farm purchasing livestock and selling them to others at a profit.

Mating Specialist

Person who looks at the pedigree of an animal, inspects the animal to determine their physical strengths and weaknesses, and selects a potential mate for that animal with the goal of improving upon the most desired traits.

Meteorologist

Also called atmospheric scientists, they study weather conditions to make weather forecasts and predictions.

Milker

Person who does the actual milking of the cows on a farm. This is also the first line observation person who may identify health issues because of identified changes in a cow's production levels. Attention to detail and the ability to follow strict on-farm procedures and protocols are important. Milkers may also administer some medications to cows, if needed.

Milk Plant Maintenance Mechanic

Person who keeps the equipment in the milk processing plant working and repaired. Mechanical engineering and electrical engineering training may be needed.

Natural Resource Conservation Specialist

Person who works with farmers to design and implement systems that reduce run-off and erosion, provide buffer areas, and improve waste handling, manure storage, and environmental improvement.

Nutrient Management Specialist

Person who works with farmers to determine the health of the soil and to manage the available nutrients, including manure on the farm, to lessen the amount of nutrients purchased.

Plant Geneticist

A person who studies plant genetics to develop new varieties that are more productive, less prone to disease, and tolerate adverse weather conditions.

Plant Pathologist

A person who studies diseases of plants.

Quality Assurance Specialist

Person who is responsible for inspecting and monitoring production to ensure that quality standards are being met.

Rotational Grazing Specialist

Person who works with farmers and landowners to explain and help implement a rotational grazing system.

Risk Management Specialist

Person who is responsible for looking at situations and then determining and recommending changes that can reduce risk, potential hazards, and potential injury to create a safer work environment.

Soil Scientist

Person who studies soil health, composition, and environmental impacts on soil. Soil scientists study how changes in soil health can impact crop growth and production.

Toxicologist

Person who studies chemicals and other substances to determine if they are safe for the environment, humans, animals, and in areas of food production.

Veterinarian

Person who diagnoses injuries and illnesses in animals. They also assist the owners with preventative health care.

Veterinary Assistant

Person who works for a veterinarian or veterinary technician.

Veterinary Pharmaceutical Sales/Representative

Person who works for a pharmaceutical company and calls on prospective customers.

Veterinary Technician

Licensed professional who works under the supervision of a veterinarian (like a physician's assistant being supervised by a doctor). A veterinary technician must pass a credentialing examination.

Vocational Agriculture Teacher

Teacher who works with high school students exploring a variety of agricultural fields.

Glossary

Abomasum

Fourth stomach chamber of a ruminant. Also called the true stomach because of its similarity to the stomach of a monogastric.

AI (Artificial Insemination)

When semen is placed into the female reproductive tract by a technician rather than through natural service.

AI (Artificial Intelligence)

Predictive software used on dairy farms that can lead to more futuristic tools which save labor, collect data, and allow for analytic decision-making. A key part of precision agriculture.

Alfalfa (*Medicago sativa*, scientific name)

A perennial legume forage crop. Stands may live more than five years and are known for their deep root system.

Ayrshire

A breed of dairy cow which originated in the county of Ayrshire in southwestern Scotland.

Balance Sheet

A financial report which lists the assets and liabilities for a business at a certain point in time. A lender may require a balance sheet when someone is applying for a loan.

Balling Gun

A tool that is used to administer boluses or capsules down the throats of cattle.

Bedding

Material that is placed in areas where cattle rest. Desirable bedding products need to be clean, absorbent, and dry. Common forms of bedding include sawdust, straw, and sand. Other materials may also be used.

Borings

Multiple soil cores taken from a field for analysis.

Brown Swiss

Breed of dairy cow that originated in the Alps region of Europe where it is known as the Braunvieh (Swiss Brown). Known for their large stature, grazing ability, and milk high in desirable components for cheesemaking.

Butterfat

Common term for the natural fat found in milk.

Calf

General term for the young/offspring of a cow and less than one year old. A heifer calf is a female baby cow under one year of age. A bull calf is a male baby cow under one year of age.

Cash Flow Statement

A financial report that shows how cash or cash equivalents enter and exit a business. Cash may enter a business through sales of an item or product, and leave to pay the expenses such as labor, insurance, etc.

Colostrum

The first milk produced by a mammal after giving birth. This milk is nutrient dense and high in antibodies needed by the newborn to strengthen its immune system.

Dam

In cattle, the dam is the mother of the calf.

DHIA (Dairy Herd Improvement Association)

An organization that assists farmers with the collection of milk samples for use in determining milk quality, individual cow production, and herd production records.

Diagnosis

To identify an illness or problem after examination and review of the symptoms.

Estrus

Also called “standing heat.” It is the period during the heat cycle when there is a high level of estrogen in the blood that can cause behavior changes such as mounting other cows, willingness to stand while mounted by other cows, and increased activity. A pedometer on a cow will record this increase in activity.

Foot Rot

A smelly bacterial infection of the hoof, usually between the toes. Can cause lameness in cattle and become debilitating if untreated.

Freshen

When a cow’s milk production starts after giving birth.

Genomics

The study of the DNA structures, makeup, and mapping in animals.

Guernsey

A breed of dairy cow that originated in the Island of Guernsey in the Channel Islands in Europe. Known for producing milk characterized by its golden color because of its B-carotene content.

Hardware Disease

The common term used for traumatic gastritis and traumatic reticulitis. When a metal or sharp object is ingested by a cow, generally in the feed and punctures the wall of the reticulum, diaphragm, or the paracardial sac. Symptoms include loss of appetite, abnormal heart sounds, pooling of fluid in the brisket area. Hardware disease can be life threatening for a dairy animal.

Hay

Herbaceous plants such as grasses and legumes that have been cut and dried for animal forage.

Haylage

Herbaceous plants such as grasses and legumes that have been cut and stored in a method that limits oxygen. Haylage is higher in moisture than dried hay and is subject to mold if oxygen is not limited.

Heat Stroke

Heat stroke in cattle is a later stage of heat stress characterized by rapid, shallow breathing with mouth open, neck extended, lethargic state, body temperature 106° F or higher. At 108° F permanent brain damage may occur.

Heifer

A female cow that has not yet given birth.

Holstein

A breed of dairy cow that originated in the Netherlands. Easily identifiable by their distinct black and white or red and white markings. The highest producing of dairy cattle breeds.

Homogenization

The process that milk goes through to emulsify the fat particles so that the cream does not rise to the top and the fat particles stay evenly distributed.

Insemination

The process of placing sperm cells into the female reproductive tract. Artificial insemination places the sperm with mechanical tools and natural insemination is also called live cover.

Intravenous

Administered into a vein.

Jersey

The smallest breed of dairy cow that originated from the Island of Jersey in the British Channel Islands. This breed is known for producing milk with the highest percentage of butterfat.

Ketosis (Acetonaemia)

Metabolic disorder also known as keto acidosis which commonly occurs within two weeks after calving when energy demands exceed energy intakes resulting in low blood glucose. Characterized by fruity smelling breath and elevated ketone levels. Treatment is important so recovery can happen.

Lactation

Starting with the birth of the calf, lactation is the period during which a cow produces milk. For comparison purposes, lactations are mathematically standardized to 305 days. The two-month period that cows are not milked prior to calving is referred to as the dry period.

Legume

Plants from the pea family, *Fabaceae*, which have the ability to fix nitrogen from the air on root nodules, important to improving soil fertility. Legumes include alfalfa, peas, and beans.

Lice

A form of parasite. Both sucking and biting lice may affect cattle. Untreated lice infestations may result in lower milk production. Easily treatable with pour-on, spray, or injectable products. Lice are species specific and are not transmittable to humans.

Lime

Amendment added to soil to increase the soil pH.

Longevity

Length of life.

Mammal

Warm-blooded vertebrates that produce milk.

Mammary Gland

In a dairy cow, the mammary gland consists of four external glands each with a teat. Together the four glands make up the udder.

Mastitis

An inflammation of the udder that may result in visibly abnormal milk, clinical mastitis, or nonvisible, subclinical mastitis. Decreased production, inflammation of the udder, and sensitivity to touch are all symptoms.

Microbes

A group of microscopic life forms that include bacteria, archaea, viruses and eukaryotes like fungi.

Milk Fever (Hypocalcaemia)

A metabolic disorder caused by low calcium levels in the blood, most common within one to two days post calving. It is usually treated easily by increasing blood calcium.

Milking Shorthorn

Breed of dairy cow that originated in Great Britain and known for their superior grazing characteristics.

Monogastric

One compartment stomach as in a person or pig.

Necropsy

An examination of an animal post-mortem (after death) which may be done to help determine the cause of death. Necropsy is post-mortem for animals while autopsy is post-mortem for humans.

Omasum

One of the four compartments in the ruminant stomach. Commonly called the many-plies compartment, it absorbs water from the partially digested feedstuff.

Parasite

May be an internal or external organism that lives in or on the host taking nutrients from the host for the benefit of the parasite.

Parturition

The act of giving birth.

Pasteurization

Process developed in 1862 by French microbiologist Louis Pasteur to heat milk to a certain temperature for a specified amount of time and kill microorganisms. Today, cold raw milk, direct from the farms is heated until it reaches 161° F. It is then held at that temperature for about 15 seconds and then rapidly cooled back to 39° F.

Pathogen

An organism that causes disease.

Pedigree

A record of ancestry presented in a standard format.

Per Capita

Latin term meaning per person.

Permeability

The rate at which water can pass through soil.

Pinkeye (Infectious Bovine Keratoconjunctivitis)

A highly contagious bacterial infection of the eye that can be spread by flies, flicking tails, or other contact. Causes inflammation, runny eyes, and temporary or permanent blindness.

Pneumonia

A bacterial or viral infection of the respiratory tract.

Post-Dipping

Occurs immediately after milking when each individual teat is dipped or sprayed with a disinfectant to kill bacteria on the teat-end.

Pre-Dipping

Prior to milking each individual teat is dipped or sprayed with a disinfectant to kill bacteria on the teat-end to prevent bacteria from getting into the milk supply.

Probe

A tool that is used to take soil borings.

Protein

Amino acid chains responsible for growth, lactation, and reproduction in dairy cattle.

Pulse

Can be taken on the left side of the cow with a stethoscope placed on the chest behind the elbow. Normal rates for a healthy mature cow are 48 to 84 beats per minute.

Ration

The amount of feed given to an animal in a 24-hour period.

Regurgitate

Part of the digestion process of cows. Feed goes through the rumen (stomach chamber 1) then to the second chamber (the reticulum), and then is regurgitated and brought back to the mouth and oral cavity in the form of cuds where it is rechewed and re-swallowed for additional digestion.

Respirations

The number of breaths taken per minute. Can be taken by observing the rise and fall of the chest. In a healthy cow, the normal range is 26 to 50 breaths per minute.

Reticulum

The second chamber of the ruminant digestive system. Commonly called the honeycomb chamber. Dense or heavy feed and or objects may settle here and it is where most incidences of hardware disease are found. The reticulum plays an important role in digestion by sorting the partially digested feed based on particle size.

Ringworm

A fungal infection of the hair and surface areas of the skin that is highly transmissible. A zoonotic condition meaning it can spread from animals to humans.

Riparian Buffer

An area adjacent to a brook, stream, lake, or wetland that is made up of perennial plants to provide conservation benefits and lessen the incidence of erosion.

Roughage

Plant-based feedstuffs which usually have a higher fiber content than forages.

Rumen

The large muscular first compartment of the cow's stomach commonly referred to as the fermentation vat.

Ruminant

An animal with a four-compartment stomach.

Scours

Diarrhea in young calves that can cause dehydration and even death if untreated. May be bacterial or viral.

Semen

Fluid from the male reproductive tract that contains sperm cells.

Silage

Fermented feed.

Sire

The male parent of an animal.

Subcutaneous

Placed or injected under the skin but not into the muscle.

Temperature

Normal temperature of a healthy dairy cow is 100° to 102.5° degrees F. Calves may be slightly higher.

Udder

A large bag-shaped organ consisting of four milk-producing glands which each drain into separate teats.

Vaccination

Administering a vaccine to increase immunity against a specific disease.

Veterinarian

A person trained to treat diseases or injuries of animals. May also provide preventative care to animals.

Warts (Infectious Papillomatosis)

Caused by the papilloma virus, warts appear as dry scaly patches on raised areas on the skin. Contagious and can spread to other animals.

Zoonotic

An infectious disease that can be spread between species from animals to humans or from humans to animals.

Appendix 1 – Answer Keys

Dairy Cow Breeds (page #)

BREED	COUNTRY OF ORIGIN	COLOR	ONE INTERESTING FACT
Ayrshire	Scotland	Red & white	A good grazer
Brown Swiss	Switzerland	Silvery brown	High cheese yield milk
Guernsey	Isle of Guernsey	Fawn to red & white	High betacarotene milk
Holstein	Netherlands	Black & white, red & white	Highest producer
Jersey	Isle of Jersey	Fawn to brown	Higher butterfat
Milking Shorthorn	England	Often roan, red & white	Their roan color
Red & Whites			A color breed

Additional discussion points:

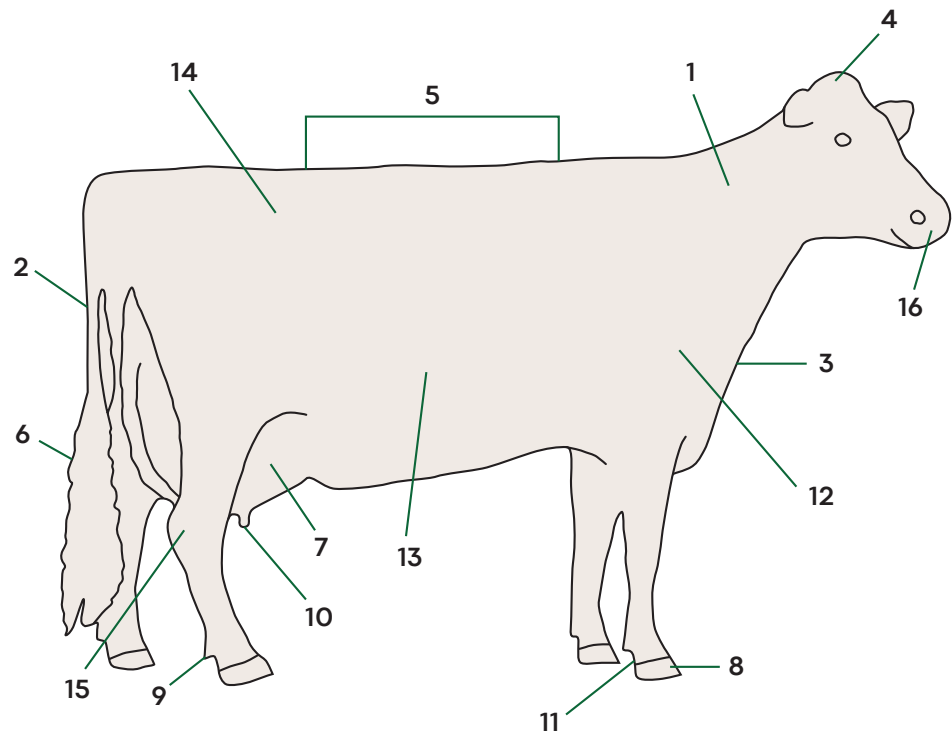
1. What breed typically produces the most pounds of milk per lactation? **Holstein**
2. What breed is known for producing “golden” milk? **Guernsey**
3. What breed is known for producing milk with the highest percent butterfat? **Jersey**

Dairy Anatomy Comparison (page #)

	HUMANS ONLY	COWS ONLY	BOTH
Has over 140 feet of intestines		×	
Has a 1-compartment stomach	×		
Regurgitates its food as part of the digestion process		×	
Has a pregnancy of approximately 280 days			×
Has a 4-chamber heart			×
Is a mammal			×
Has the ability to sweat as a means of cooling the body	×		
Has 49-51 bones in the spine		×	
Has a normal body temperature of 98.6 degrees F	×		
Has 2 knees			×
Has cloven feet		×	
Is born with no upper teeth			×

Dairy Anatomy Level 1 (page #)

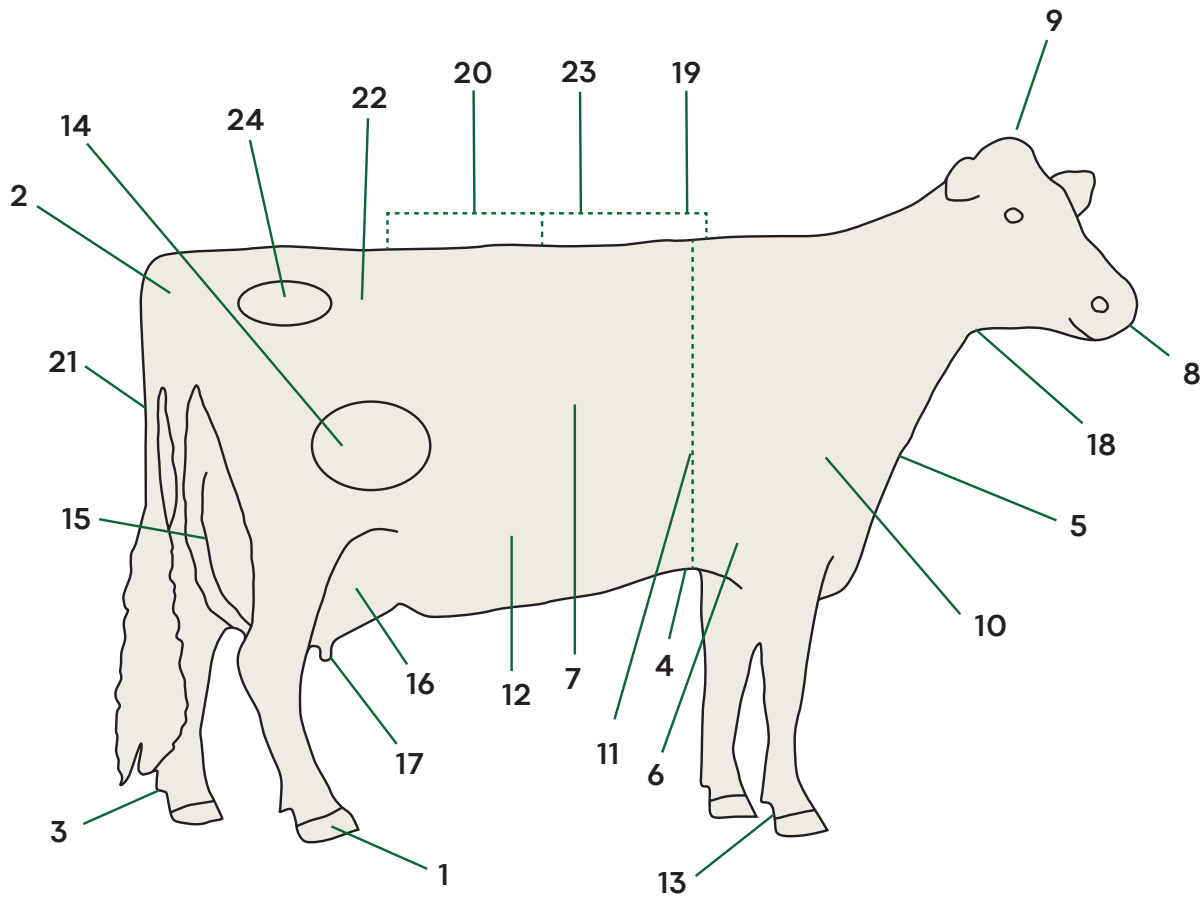
- 1 neck
- 4 poll
- 5 back
- 3 dewlap
- 6 switch
- 12 point of shoulder
- 11 pastern
- 13 barrel
- 14 hips
- 2 tail
- 15 hock
- 10 teat
- 8 hoof
- 7 udder
- 16 muzzle
- 9 dewclaw



Breeds of Cows—Bovine

Ayrshire	(C — Scotland)
Brown Swiss	(F — Switzerland)
Guernsey	(D — Isle of Guernsey)
Holstein	(A — Netherlands)
Jersey	(B — Isle of Jersey)
Milking Shorthorn	(E — England)

Dairy Anatomy Level 2 (page #)



<u>4</u>	chest floor
<u>2</u>	pins
<u>18</u>	neck
<u>9</u>	poll
<u>19</u>	chine
<u>17</u>	teat
<u>6</u>	elbow
<u>10</u>	point of shoulder
<u>11</u>	heart girth
<u>12</u>	barrel
<u>7</u>	ribs
<u>20</u>	loin

<u>24</u>	thurls
<u>23</u>	back
<u>22</u>	hips
<u>21</u>	tail
<u>5</u>	dewlap
<u>14</u>	stifle
<u>16</u>	fore udder
<u>15</u>	rear udder
<u>13</u>	pastern
<u>3</u>	dewclaw
<u>1</u>	hoof
<u>8</u>	muzzle

Unified Dairy Scorecard (page #)

Frame: The skeletal parts of the cow, with the exception of the rear feet and legs.	<u>15%</u>
Dairy Strength: A combination of dairyness and strength which supports production and longevity.	<u>25%</u>
Rear Feet and Legs: Evidence of mobility, rear view, side view, and thurl position.	<u>20%</u>
Udder: Major consideration is given to those traits that contribute to high milk yield and a long productive life.	<u>40%</u>
	<u>100%</u>
	TOTAL %

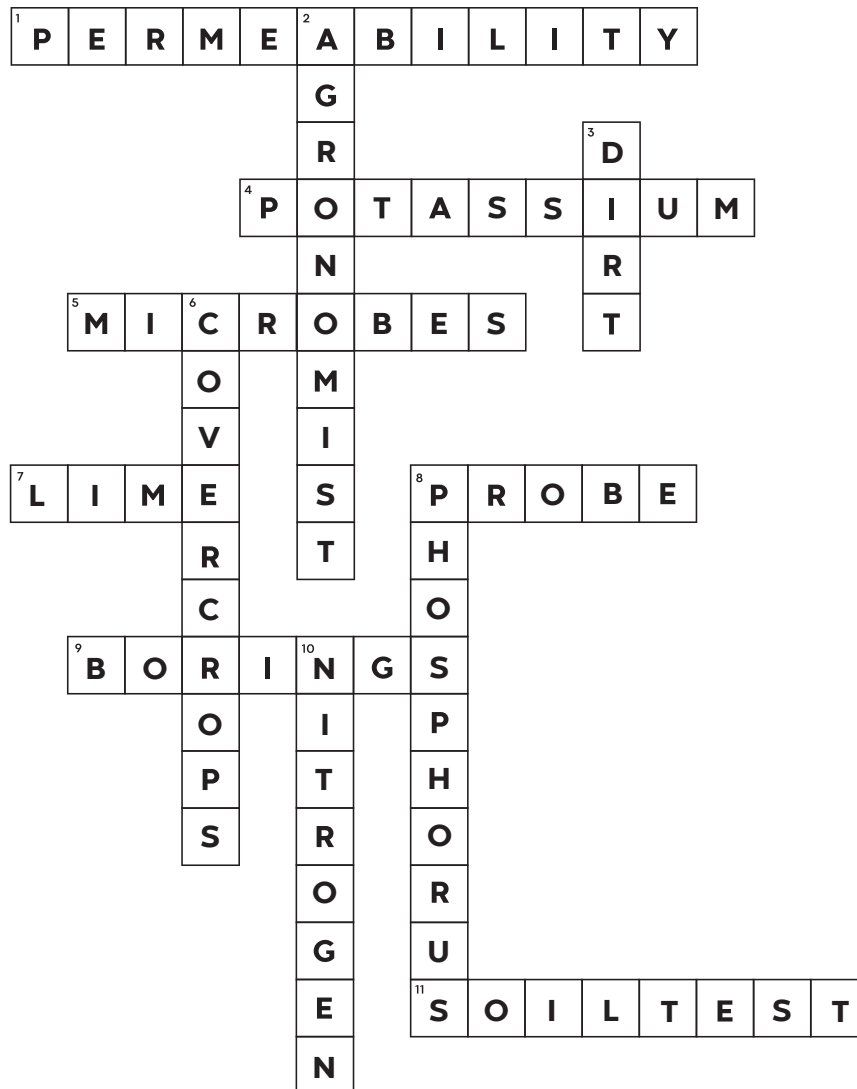
Dairy Health (page #)

A. Ringworm	<u>K</u>	Examine and determine what is wrong
B. Pinkeye	<u>F</u>	An instrument for measuring temperatures
C. Warts	<u>B</u>	Redness and inflammation of the lining of the eye
D. Lice	<u>I</u>	A device used to give cattle boluses
E. Scours	<u>G</u>	The measurement of blood surging through an artery
F. Thermometer	<u>A</u>	Infectious skin disease caused by a fungus
G. Pulse	<u>C</u>	A small growth on the skin
H. Foot Rot	<u>H</u>	Causes lameness in an animal
I. Balling Gun	<u>J</u>	An individual who visits a farm for animal health
J. Veterinarian	<u>E</u>	Manure that is of watery consistence
K. Diagnose	<u>D</u>	An external parasite

Manure Management (page #)

BREED**	AVERAGE LIVE WEIGHT	POUNDS OF MANURE PRODUCED PER DAY	GALLONS OF MANURE PRODUCED PER DAY	GALLONS OF WATER IN MANURE PER DAY
Ayrshire	1,200 lbs.	$1.2 \times 89 = 106.8$	$1.2 \times 10 = 12$	$12 \times .873 = 10.5$
Brown Swiss	1,500 lbs.	$1.5 \times 89 = 133.5$	$1.5 \times 10 = 15$	$15 \times .873 = 13.1$
Guernsey	1,100 lbs.	$1.1 \times 89 = 97.9$	$1.1 \times 10 = 11$	$11 \times .873 = 9.6$
Jersey	1,000 lbs.	$1.0 \times 89 = 89$	$1.0 \times 10 = 10$	$10 \times .873 = 8.7$
Holstein	1,500 lbs.	$1.5 \times 89 = 133.5$	$1.5 \times 10 = 15$	$15 \times .873 = 13.1$
Milking Shorthorn	1,250 lbs.	$1.25 \times 89 = 111.25$	$1.25 \times 10 = 12.5$	$12.5 \times .873 = 10.9$
Red and White	1,400 lbs.	$1.4 \times 89 = 124.6$	$1.4 \times 10 = 14$	$14 \times .873 = 12.2$

Soils Crossword Answers (page #)



Across

1. A measure of the rate at which water can pass through soil
4. Soil element critical for plant health and growth, seen as K on the soil test
5. A group of microscopic life forms that includes bacteria, archaea, viruses, and eukaryotes like fungi
7. Amendment added to soil to increase the soil pH
8. Tool used to take soil borings
9. Another name for the multiple soil cores taken from a field for analysis
11. Process of collecting soil borings for analysis (2 words)

Down

2. Person who studies soil management and crop production
3. Slang word for soil
6. Plants used to reduce soil erosion after a harvest (2 words)
8. High levels of this nutrient in run-off can cause algae blooms
10. Legume plants have tiny root nodules that can fix this nutrient

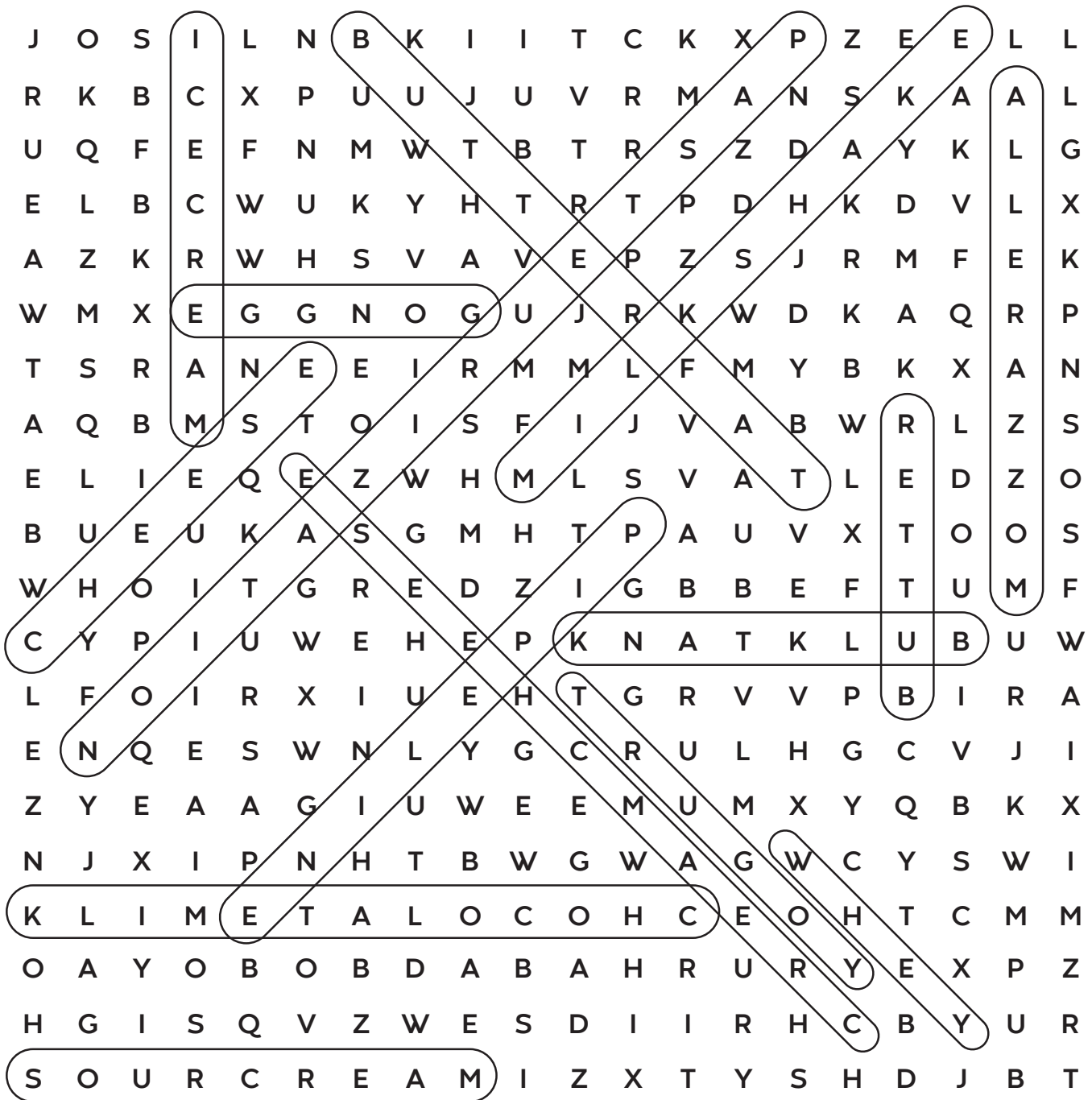
Dairy Foods (page #)

1. Cottage Cheese	<u>4</u>	Enzyme used in cheese making
2. Yogurt	<u>3</u>	A milk protein
3. Casein	<u>15</u>	By-product of cheese making
4. Rennet	<u>7</u>	Cheese made from goat's milk
5. Pasteurization	<u>12</u>	Acid that gives milk a sour taste
6. Homogenization	<u>10</u>	Milk is churned into this product
7. Chevre cheese	<u>9</u>	Cheese made from sheep's milk
8. Low-fat milk	<u>14</u>	Coagulated mixture of milk and eggs
9. Roquefort	<u>2</u>	Cultured milk product
10. Butter	<u>11</u>	Soft cheese made with a surface mold
11. Blue cheese	<u>1</u>	Curds of milk proteins; a soft cheese
12. Lactic acid	<u>13</u>	Unpasteurized milk
13. Raw milk	<u>5</u>	Milk that has been heated to 160° F for 30 minutes
14. Custard	<u>8</u>	Milk that is 1 to 2% butterfat
15. Whey	<u>6</u>	Process of breaking up fat particles

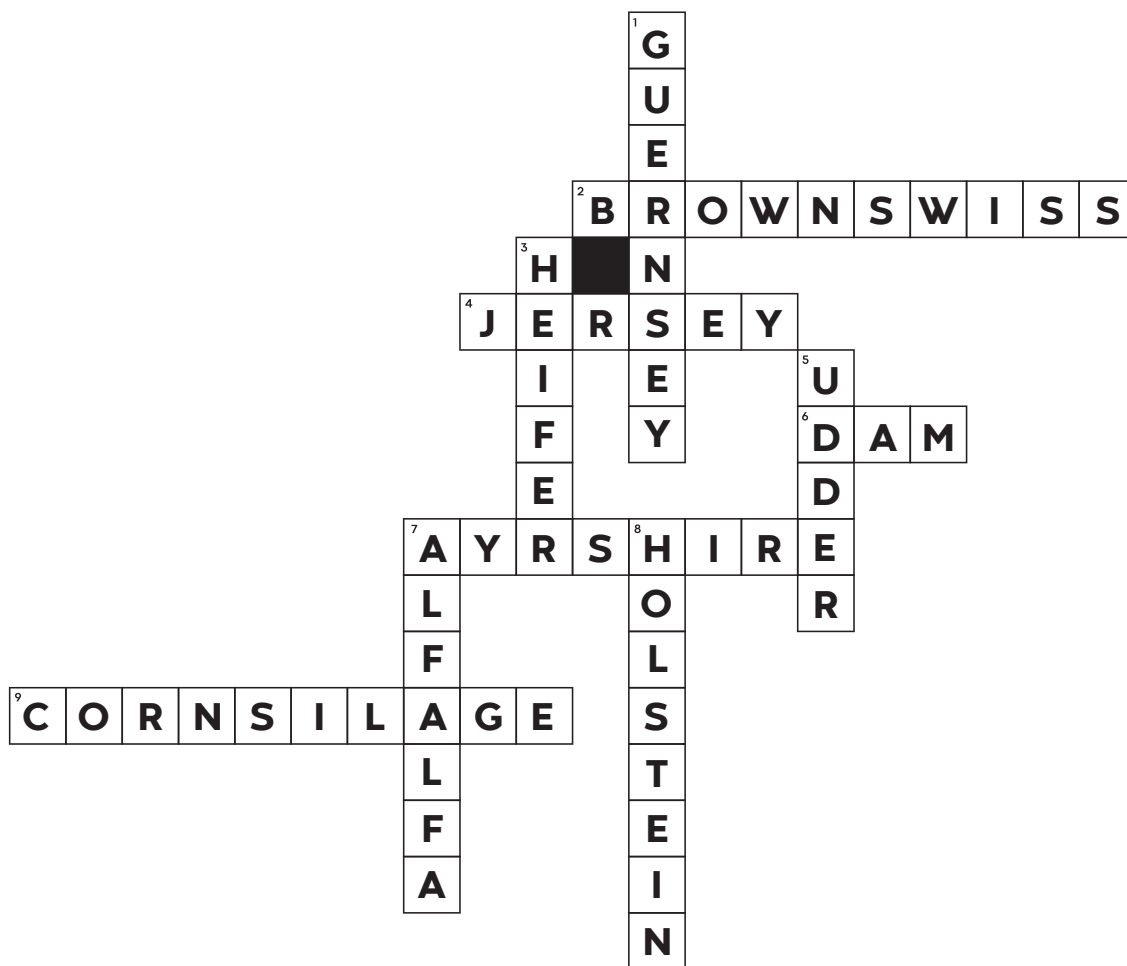
Dairy Foods Part 2 (page #)

1. Bulk Tank	<u>4</u>	First milk a cow produces after giving birth
2. Butter	<u>2</u>	Dairy product made from the fat protein of churned cream
3. Calcium	<u>14</u>	Hard Italian cheese often grated and served on spaghetti
4. Colostrum	<u>5</u>	Powdery outer coating on cheese that forms during aging process
5. Rind	<u>13</u>	Hard cheese with holes/eyes resulting from carbon dioxide released during the maturation process
6. Cud	<u>7</u>	Breaking up of fat particles to keep cream from rising to the top
7. Homogenization	<u>10</u>	The process of aging cheese
8. Ice cream	<u>12</u>	Dairy product used in dips and on baked potatoes
9. Mozzarella	<u>3</u>	Nutrient in milk important to bone building
10. Cheese affinage	<u>6</u>	Globs of feed regurgitated from a cow's first stomach compartment
11. Processing plant	<u>1</u>	Stainless steel structure where milk is stored
12. Sour cream	<u>11</u>	Facility where milk is prepared before going to retail outlets
13. Swiss cheese	<u>9</u>	Stringy cheese commonly used on pizza
14. Parmesan	<u>8</u>	Frozen dairy treat

Wordsearch Answers (page #)



Dairy Crossword Answers (page #)



Across

2. A breed of large brown cows (2 words) – originated in the Alps
4. Smallest dairy breed
6. A cow's female parent
7. A hardy red and white breed of medium stature
9. An annual crop that is chopped and is major feed in a cow's diet (2 words)
 Hint: First word – people like to eat it off the cob
 Hint: Second word – the resulting product when the first word is fermented

Down

1. A breed of cow that gives golden milk
3. A term for a yearling female
5. A term for a cow's mammary gland
7. A legume grown for hay or silage
8. A black and white breed of cow



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